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THE OHIO FLOODS: THEIR CAUSE AND THE REMEDY

By Robert V. R. Reynolds, U. S. Forest Service

A LARGE number of newspaper editorials upon the Ohio floods concern themselves with the relation between that catastrophe and the deforestation of Ohio and other States in the same drainage basin. A medley of opinions is presented, ranging from flat denial that the destruction of the forest cover has had any tendency to increase the speed of the run-off, to the statement that forests would have prevented the floods. This wide range of opinions is to be expected, since it is based in part upon the extreme views of a group of observers whose official station gives their statements weight, and partly on the utterances of partisans whose ill-considered claims do the cause of forestry much more harm than good.

The *Scientific American* takes a sound view, editorially, but gives much space to an unsigned article in which the following extraordinary statement is made:

"The solution of the problem is still remote, but much has, at least, been done toward correcting erroneous ideas. Thus it was once generally believed that floods were largely the result of deforestation. *Today the relations between forests and floods tend to become a merely academic question; or, at least, no competent student of the subject now looks upon the forest as a factor of prime importance.*"

Denied, though they are, by this statement, the privilege of recognition as competent students of the subject, it may nevertheless be interesting to note the findings of experts of the Geological Survey and of the Forest Service.

During the past year the Geological Survey reached the following conclusion after thorough comparative investigation of two adjacent White Mountain watersheds of nearly the same size, and otherwise similar in all respects, except that one was well forested while the other had been logged and burned:*

"The particular case of the Burnt Brook and Shoal Pond Basins is typical for the region, and establishes the general conclusion that *a direct relation exists between forest cover and stream regulation.*

"The results of the * * * studies are held to show that throughout the White Mountains the removal of forest growth *must be expected to decrease the natural steadiness of dependent streams during the spring months at least.*

"Deforestation followed by fires * * * *results in conditions unfavorable to natural spring storage because conducive to rapid snow melting and stream run-off.*

"The favorable showing of this report is of general application in the White Mountain area."

From a review of the results of experiments and observations conducted by foresters and other scientists in all parts of the world the Forest Service

*U. S. Geological Survey Report No. 13, Preliminary Statement on White Mountains, New Hampshire.

THE ATTEMPT TO MAKE FARMS OF STEEP, DEFORESTED SLOPES ALWAYS RESULTS IN EROSION AND DISTURBANCE OF THE RUN-OFF, UNLESS CAREFUL TERRACING IS PRACTICED, AS IN ASIATIC COUNTRIES. SCENES LIKE THIS ARE FREQUENT IN THE APPALACHIAN MOUNTAINS.

QUENT IN THE APPALACHIAN MOUNTAINS.

EROSION IN THE APPALACHIAN MOUNTAINS. CULTIVATION OF STEEP, DEFORESTED HILLSIDES RESULTS IN THE LOSS OF SOIL AND CHOKING OF STREAM BEDS WITH GRAVEL.

CHARACTERISTIC HILLTOP IN WEST VIRGINIA. ALL TIMBER AND GROUND COVER DESTROYED BY FIRE FOLLOWING LOGGING. THE SOIL WASHED OFF THE UNDERLYING ROCKS.

reaches the following conclusions, among others:*

"In the mountains, the forests, by breaking the violence of rain, retarding the melting of snow, increasing the absorptive capacity of the soil cover, preventing erosion, and checking surface run-off in general, increase underground seepage and so tend to maintain a steady flow of water in streams.

"Among the factors, such as climate and character of the soil, *which affect the storage capacity of a watershed and therefore the regularity of stream flow, the forest plays an important part,* especially on impermeable soils. The mean low stages as well as the moderately high stages in the rivers depend upon the extent of forest cover on the watersheds. The forest tends to equalize the flow throughout the year by making the low stages higher and the high stages lower."

"*Floods which are produced by exceptional meteorological conditions can not be prevented by forests, but without their mitigating influence the floods are more severe and destructive.*"

There is no doubt that exceptional meteorological conditions prevailed in the Ohio Valley in the latter part of March and the early part of April. To quote from the article in the *Scientific American,* mentioned above, which bears the earmarks of authority in regard to the weather conditions:

" * * * the Onio River system was visited (during the period mentioned) by *the most remarkable flood in its history.* The successive phases of this occurrence were as follows:

"(1) Torrential and long-continued rains over the North-central watershed of the system, dating mainly from

*Final Report of the National Waterways Commission, Appendix V, Forests and Water in the Light of Scientific Investigation, by Raphael Zon, Chief of Silvics, Forest Service.

HILLSIDE EROSION IN APPALACHIAN MOUNTAINS. THE TIMBER WAS REMOVED AND THE EROSION FOLLOWED CULTIVATION OF THE SOIL. FINALLY THE FIELD ITSELF WAS ABANDONED.

AN INDIAN PASTURE SHOWING EROSION GULLEY FULLY DEVELOPED.

March 23. *At many places the rainfall was without precedent.** Thus up to the morning of the 27th Bangorville, Ohio, had a total of 9.50 inches (the normal rainfall for the whole month of March at that place is 3.93 inches); Marion, Ohio, 10.60 inches (normal for the month, 3.51 inches); Bellefontaine, Ohio, 11.16 inches (monthly normal, 3.79 inches). *Eye witnesses describe the rain as coming down in solid sheets, as in a cloudburst.* Previous conditions were not especially favorable for floods. River stages were not high before the great rains began; there was no snow on the ground to cause by its rapid melting the sudden swelling of the streams, as so often happens in spring freshets; and, lastly, the ground was not frozen—a condition that prevents the rain from soaking into the soil and thus increases the percentage of run-off. Nevertheless, the rivers of Southern Ohio and Indiana experienced the worst floods on record in that section.

"(2) By the morning of the 27th the rainfall area had spread to the Southern watershed of the Ohio, and also to the headwaters above Pittsburgh. Thus from North, South, and East huge volumes of water were pouring into the main river, along which flood-stages were soon exceeded.

"(3) On the morning of the 27th rain or snow was still falling over the whole watershed of the Ohio and throughout the Northwestern States. Serious floods occurred in several sections outside of the Ohio system. * * * On the 27th the weather cleared up all over the Eastern States.

"(4) At the beginning of April the center of interest shifted to the lower Ohio, where the flood proceeded normally, as there were no further rains of any consequence to complicate the situation.

"From the foregoing summary it will be seen that of the four periods into which this series of floods may be divided, only the first was particularly striking and sensational. It was attend-

*Italics supplied by the author of this article.

VIEW SHOWING EROSION FOLLOWING DEFORESTATION ON THE TENNESSEE RIVER.

ed by a great loss of life, as compared with ordinary river floods in this country, although, according to present estimates, probably not more than a tenth as great as that caused by the bursting of the Johnstown dam, in 1889, or that attending the irruption of a storm-wave in Galveston in 1900, and almost insignificant compared with the loss of life in some of the river floods of China† and the storm floods of India."‡

FLOODS ARE INCREASING.

The Ohio basin was once heavily forested. The larger part of that forest has been removed, some of it unwisely, within a comparatively short period. While the effect of the removal is undoubtedly extensive and favorable to flood, it has been counteracted to a considerable extent by the cultivation of a large amount of the denuded surface, a condition which is, next to a good forest cover, the most favorable that can exist on a flat country, to promote seepage and prevent rapid run-off. In mountainous country the stripping and cultivation of slopes is liable to result in heavy erosion and a run-off much more rapid than in the forested condition.

There is little good to be gained by attempting to defend either extreme point of view. On the one hand it is known that, even when heavily forested, a portion of the Ohio basin suffered years ago from floods, resulting in part, perhaps, from the presence of large areas of marshy country, which is impervious to seepage.

On the other hand, the researches of Leighton (Geological Survey) and of

†A notably deforested country. ‡A country of torrential precipitation.

SHOWING DENSE GROWTH IN THE FRENCH ALPS USED EFFECTIVELY IN CHECKING FLOODS.

VALLEY LAND IN M'DOWELL COUNTY, NORTH CAROLINA, STRIPPED OF SOIL BY AN UNDULY HEAVY SPRING FRESHET.

Hall and Maxwell (Forest Service) show unmistakably that floods are steadily on the increase in some of our most important rivers, of which the Ohio is one. This is particularly true of the rivers which rise in the Appalachian Mountains, and the increases seem to be greatest on the Ohio and certain other rivers where the most forest has been destroyed.

Had the primeval forests of the Ohio never been removed there would nevertheless have been a great flood under the extraordinary rainfall of March. No forest, however dense, however well carpeted with humus and litter, could have restrained, completely, the rush of that tremendous torrent or rain. It is safe to say, however, that the flood would not have been as deep, the run-off would have been less violent, and there would have been far less erosion if the forest had still been there.

We can not safely assume that, because the meteorological conditions were extraordinary in this case, another great flood will not sweep the Ohio until equally great precipitation occurs again. The Ohio has a far heavier annual precipitation and discharges a far greater per cent of it than any other river in the Mississippi system. The erosion following deforestation establishes conditions which automatically become more extensive and aggravated and which tend to increase the violence and volume of the run-off each time flood conditions recur. The circumstances in this instance, as previously quoted, were in several respects unfavorable for a great flood. The rivers were not at a high stage before the flood rains began, there was little or no snow on the ground, and the ground itself was not frozen. Moreover, the cultivation of non-forested parts of the watershed was favorable to the absorption of water. Except for the torrential nature of the rainfall and the fact that the land was wet from the melting of the winter snow, the condi-

PENNSYLVANIA FOREST DESTROYED BY FIRE FOLLOWING LOGGING. THE DUFF AND LITTER ARE GONE, ALLOWING EROSION AND RAPID RUN-OFF TO DO THEIR WORST.

SHOWING HOW FARMING IS DONE IN THE PATH OF THE FLOOD DISTRICT OF WU-T-AI-SHAN, NORTHERN SHAN-SI PROVINCE, CHINA. A VALLEY AT THE BASE OF THE MOUNTAINS WHICH, DURING THE SPRING RAINS, IS COVERED BY FLOOD WATERS. THE STONE WALLS CATCH SOME OF THE SEDIMENTS, AND CROPS ARE GROWN ON THE SOIL THUS SAVED.

ERODED ALLUVIAL LAND AT MOUTH OF ROBBIN HOLLOW AND DRIFT LEFT OVER FARMING LAND. WESTMORELAND COUNTY, PA.

tions were not such as to make the occurrence of a great flood probable. It seems by no means impossible that on some future occasion a less torrential but protracted rain of general extent, falling on heavy, belated snow, might cause a flood rivalling the one just past, if the surface of the ground were covered with ice or solidly frozen.

Granting the improbability of its frequent recurrence, this great flood is a solemn warning of what can occur again, perhaps, within the next decade, especially if, as asserted, we are now passing through a cycle of wet years. Fortunate conditions may prevent its recurrence for forty, sixty, or even a hundred years. Even so, the United States can not afford to let it come without making adequate preparation.

Above all, this seems a time for action rather than for useless controversy. Much better were all controversy forgotten and the earnest efforts of capable Americans bent upon the problem of making such catastrophes impossible in the future. The example at Panama should breed confidence.

PLANS FOR PROTECTION.

The plans already suggested for protection include three separate proposals:

First, to straighten, deepen, and widen the river channels in order to promote rapid discharge, which will lower the peak of a flood.

Second, to build storage reservoirs, which can be filled at high water and drained successively as the river channels are able to carry the flood waters.

Third, to reforest suitable non-agricultural areas, covering as large an area as possible of the drainage basin, particularly on the sources and along the streams.

No one of these methods alone can be sufficient. The project which depends solely upon improvement of the channels and protection of the banks by levees is the plan practiced hereto-

EXCESSIVE EROSION ON NEARLY LEVEL LAND, YAZOO UPLANDS. GULLIES WITH VERTICAL WALLS EAT INTO CULTIVATED LAND WITH REMARKABLE RAPIDITY AND THIS MAY BE PREVENTED ONLY BY REFORESTATION.

fore and has repeatedly proven itself insufficient, because the works continually have to be increased to keep pace with the increasing floods. Enormous sums have been spent in such inprovements by the United States, the States, and the communities endangered. To conduct engineering works of this kind upon a scale sufficient to really obviate all danger would be so expensive as to render the scheme impracticable.

To depend upon reservoirs alone would be equally impracticable. The quantity of water discharged by the Ohio during the recent floods, in addition to the normal flow of the river, would fill basins so enormous that even if proper locations for dams could be assured and the dams could be built sufficiently high and long, the area flooded would cover so much valuable farming country as to render the scheme impossible of execution.

It would be equally fatuous to depend upon reforestation alone. In the first place, large portions of the Ohio Valley must remain unforested because they are needed for the higher use of agriculture and for the sites of cities and villages. Even when that basin was completely forested it was flooded, at least in part. Therefore the most perfect of protection forests upon the greatly reduced area remaining available for such purposes, no matter how great an accumulation of humus there might be, would not be able to store a sufficient quantity of flood waters to prevent floods under the much more adverse conditions which now exist.

Each plan depends intimately upon the others for enough aid to render the whole scheme successful. The system of levees and channel improvements requires a system of reservoirs in cooperation with it. Otherwise the levees

A STRIKING EXAMPLE OF EROSION RESULTING FROM COMPLETE DESTRUCTION OF TIMBER AND HERBACEOUS COVER BY CHEMICAL FUMES FROM SMELTERS. DUCKTOWN, TENNESSEE.

must be so high and long, and the channel improvements so unceasing and costly as to defeat any possibility of success.

The system of reservoirs depends in turn upon the levees and channel improvements, otherwise the dams would have to be so large and the reservoir basins so extensive as to put them out of the question as a practical remedy.

THE VALUE OF REFORESTATION.

Both of the plans which involve engineering works are dependent upon reforestation of all available parts of the watershed. Reforestation should take place mainly upon the steep country at the sources of the rivers—the portion of every watershed which is most sensitive and the point where the greatest erosion takes place. Such forests greatly reduce the speed and diminish the volume of run-off during all but the most extraordinary flood conditions, and would almost entirely prevent erosion of the areas they cover. The system of levees and channel improvements would be relieved by the forests because the peak of the floods would be diminished, and levees of smaller size both in height and length would suffice. The formation of bars would be greatly reduced, thus obviating the constant heavy expense of up-keep resulting from the necessity of dredging the ever-narrowing channels. The system of reservoirs would be even more dependent upon protection forests since a reservoir to be effective must be able to take in its

DUCKTOWN, TENNESSEE. SOIL AND GRAVEL FROM THE DENUDED SLOPES WASHES INTO THE STREAM BEDS AND COVERS THE BAR.

full capacity of water. Such floods as take place in the Ohio Valley would soon fill with debris any system of reservoirs that could be constructed, unless the silt and gravel resulting from erosion at the head are kept out of the river. The most effective means to this end is reforestation. With the aid of protection forests, lower dams, smaller gates and locks, and less extensive reservoir areas would be sufficient. The reduction of the necessary height of dams would have a powerful influence in reducing the cost of the project, since under some conditions the cost of engineering works of this character may be very much more than doubled if the height is doubled.

Deforestation alone did not cause the Ohio flood, although the deforested condition doubtless made the depth and speed of the rushing waters much greater than they would have been otherwise. No conceivable forest upon the watershed could have completely prevented a flood under the extraordinary conditions of rainfall on this occasion. But on the other hand, no system of improvements for flood prevention on the Ohio which leaves protection forests out of account can be either economical or permanently successful.

A FOREST EXHIBITION

A FOREST exhibition will be held in Horticultural Hall, Philadelphia, May 19 to 24, under the auspices of the Pennsylvania Forest Association, and it promises to be not only a very interesting, but an instructive display, as well. The Pennsylvania organization has undertaken the exhibit to arouse interest in forestry and funds have been raised to provide for the expense. A number of exhibitors have already signified their intention to have large displays. In addition to these there will also be a series of lectures which should attract much attention as they will be by leading experts on forestry subjects. If the legislature does not require his attention in Harrisburg, Governor Tener will attend the exhibit and formally open it.

Among the exhibitors will be:

The American Forestry Association.

Pennsylvania Department of Forestry.

Pennsylvania Chestnut Tree Blight Commission.

Pennsylvania State College.

University of Pennsylvania.

United States Forest Service.

United States Reclamation Service.

Philadelphia Commercial Museums.

University of Washington.

Pennsylvania State Museum.

Audubon Society of Pennsylvania.

City Parks Association of Philadelphia.

Pennsylvania Fish Protective Association.

Forestry Department of Pennsylvania Railroad.

Exhibits made also by Lumbermen's Associations, manufacturers of wood substitutes, etc.

REPORT OF MAINE'S FOREST COMMISSIONER.

The Forest Commissioner of the State of Maine, Mr. Frank E. Mace, has issued an excellent bound volume containing his report for the year 1912, and also a report of the wood-using industries of the State of Maine prepared by J. C. Nellis, of the United States Forest Service. The report is amply illustrated and contains a great deal of exceptionally valuable information for all lumbermen and foresters who are interested in the forest products of that State.

THE RETURN OF THE BEAVER TO THE ADIRONDACKS

By Ernest A. Sterling

DAME FASHION has many absurdities, and even crimes, laid at her door, not the least of which among early follies was practically depopulating a continent of the sagacious beaver, whose only offense was the possession of a fur desired by hatters to meet the current dictates of fashion.

The story of the beaver concerns a race of intensely interesting animals which came dangerously near extinction. In fact, they are entirely gone from most of their old haunts, and only their continent-wide distribution and eleventh-day legislation for their protection kept them from being classed with the bison, or even with the auk and the dodo. Like many other of our natural resources, the beaver could have been used and perpetuated so as to remain an important factor in the fur trade, instead of being commercially eliminated by thoughtless greed.

Ranging at one time from Hudson Bay to the Rio Grande, the beaver was at once the most abundant and valuable fur-bearing animal known to the early settlers and explorers. It was at the same time one of the most easily captured, owing to its social nature and method of living. Always shy and retiring, and subsisting on a vegetable diet, the beavers did not roam at large, the colonies from their location along streams were accessible and easily detected, and trapping and hunting was readily made deadly and effective.

The early history of America is intimately associated with the beaver. The pelts at an early date were a standard of value, and remained so until quite recently in some of the remote portions of the far north. It has often been related how the Hudson Bay Company waxed prosperous by making the standard of exchange for a gun a pile of beaver pelts as high as the gun was long—and it should be remembered that a gun in those days was often longer than the man who carried it. One small beaver skin today would purchase a gun such as the early trappers never dreamed of. When the first settlers began making clearings in the unbroken forests along the Atlantic they broke down the beaver dams and grew their first crops of meadow hay on the mud flats thus exposed, some of these same flats later becoming rich agricultural land. One of the Dutch colonies showed their recognition of the beaver by incorporating it in the seal of New Netherlands; while the great Canadian Pacific Railway still surrounds their emblem with the figure of a beaver.

The demand for the fur, as a result of the custom of wearing beaver hats which prevailed in England and America for two hundred years or more prior to 1840, led to the commercial trapping of the animals in enormous numbers. Later the fur was used for a variety of purposes, so that the demand did not cease until nearly the end of the nineteenth century, and then only because the supply was exhausted. During the quarter century from 1853 to 1877 the Hudson Bay Company shipped over three million beaver skins to London, and this was after the period of greatest demand had passed. It would be impossible to estimate the number of beaver pelts exported and used locally during the first two hundred years of settlement in America, but it is certain that the output totaled many millions. Even during the early period from 1624 to 1634 statistics show that 80,183 beaver skins were shipped from New Amsterdam, while some fifty years later the exports from the same port had risen to fully 80,000 per year. Not only were the animals killed for their fur, but the Indians deemed the flesh of the beaver

BEAVER WORK. CUTTING A FELLED ASPEN INTO LOGS.

excellent food, although the skins were not specially prized by them. Before white men offered an incentive the Indians killed only a limited number to meet their simple requirement for food and covering.

So extensively were they trapped that beaver had become very scarce in the northern forests by the beginning of the last century. The War of 1812 put a check on hunting and trapping, and the colonies recovered somewhat, but never regained anything like their original strength. Soon after hunting was resumed, following the war, beaver became scarce again, and by 1840 had practically disappeared.

The status of the beaver on the eastern seaboard ten to fifteen years ago was that of an animal with a very precarious foothold on existence. Isolated individuals or colonies existed in remote parts of Maine and the Adirondacks and in the Maritime Provinces, but the direct line of descendants on which the perpetuation of the species depended hung by a very slender thread, which would have been easily snapped by an epidemic or further postponement of protective laws. More populous colonies existed in the Rocky Mountain region, the Lake State and in the Hudson Bay country, but at best only a sad remnant of the original hordes remained anywhere in America. They were perhaps destined, like the bison, to give place to advancing civilization; but, unlike them, did not need a large open area in which to roam, and their extermination was not necessary before settlement could proceed. The beaver will thrive on non-agricultural land in almost any wooded, well-watered country, and their presence will not interfere with development of any kind.

With specific reference to the North Woods it was the writer's privilege in 1899 to see beaver dams and colonies north of the headwaters of the Penobscot river in Maine, some forty miles from any habitation. These colonies were without doubt direct descendants of the original beaver stock, and in that wild region, which will probably never be settled, needed only reasonable protection to regain much of their lost ground and become distributed over a wide territory. In the Adirondacks in 1901, fresh beaver signs in the form of felled aspens, but no houses or dams, were found near the mouth of Amersand Brook quite close to traveled roads and streams. Whether these were a few individual survivors from the colonies which formerly inhabited almost every water course in the region,

BEAVER DAM, GALLATIN RIVER, MONTANA. THE BEAVER SEEN ON THE DAM SWAM DOWN AND PERCHED ON THE DAM JUST AS THE PICTURE WAS TAKEN.

or were some of those liberated about the time, is not known. The former surmise is probably correct unless they escaped or were freed from a private preserve, because the State did not make the first purchase of beaver for restocking the Adirondacks until 1904.

In any event the return of the beaver to the Adirondacks as a result of the protection afforded by wise laws making a permanent closed season, is an interesting chapter in natural history. The tenacity with which they have held on to racial existence during nearly three hundred years of persecution, accompanied by marked changes in natural environment, adds a distinct element of pathos and sentiment to the situation. Had they become actually extinct and been re-established from outside sources much interest would still have been attached to the undertaking; but the fact that the line was never quite broken and the species is being perpetuated in a definite region through natural increase resulting from protection, assisted perhaps by the infusion of new blood from introduced stock, seems all the more wonderful.

Definite historical data is naturally lacking, yet we have estimates from a reliable authority which indicate that in the year 1609, upon the coming of the white man, there were not less than one million beaver in the Adirondack region. By 1800 it is estimated that the number had dropped to 5,000, with a slight recovery during the War of 1812, but by 1830 not over 500 remained. Since 1850 the number remaining has been so small that several writers reported the species exterminated in New York State. It has since been proven that they were not extinct, but the number was so few it is not surprising that guides and native residents did not know of their existence.

The best evidence now indicates that the number of beavers in the wild state were gradually reduced from about 100 in 1850 to 25 in 1880, with the minimum reached in 1895, when there were probably not over five individuals remaining in the whole wooded uplift comprising northern New York. The streams on which they were once abundant floated logs for pulp and lumber instead of the aspen sticks which the industrious beaver, who were the first lumbermen and engineers, cut for domestic use. The French-Canadian log drivers riding on top of the man-felled trees took the place of the beaver swimming alongside of the small logs which

A RECENTLY FELLED ASPEN. THE LARGE BEAVER CHIPS ARE VERY NOTICEABLE.

TUNNEL AT END OF BEAVER "SLIDE," THROUGH WHICH MATERIAL FOR TWO LARGE HOUSES WAS DRAGGED INTO THE RIVER.

their own energy and sharp teeth had converted into usable form. Only occasional overgrown dams or houses remained to indicate the scope of the animal-engineering enterprises carried on when mere strength of numbers made the struggle for existence against natural conditions a most serious problem.

The causes of the diminution in numbers from millions to almost nothing were many. One of the first was the struggle between the French and Algonquin Indians on the north, and the English, Dutch and Iroquois on the south for the control of the fur trade. Northern New York became the battle ground in what was virtually a war of extermination, directed especially against the inoffensive beaver, the Indians forgetting their superstitious regard for the beaver, and becoming ruthless hunters under the lure of the "fire water" and trinkets offered by the white men. Coupled with this senseless slaughter as a result of rivalry, was the discovery of a valuable secretion of the beavers, known as castoreum, which has long been used for medicinal purposes. Castoreum was also found by the Indians to be a great attraction to beaver, and used as a bait lured many hitherto wary individuals to the skinning knife. The later use of steel traps and guns added greatly to the slaughter, and had not the discovery that the fur of the abundant South American Coypu served the same purpose and was even of greater value in making hats, it is doubtful whether a single beaver would have been left in the northern forests, or even on the whole continent. During later years, after active hunting had ceased and only a few scattered colonies remained, lumbering and forest fires no doubt did much to keep down the natural increase, because of the interference with the food supply and the log driving in the streams which broke up the beaver houses.

Interest in the perpetuation of the beaver in the Adirondacks was aroused to definite purpose by legislative action in 1895; while in 1904 a body of public-spirited citizens secured the passage of a bill providing for the liberation of beaver, and for more absolute protection of those remaining. At this time the few remaining animals were confined to one or two streams in township 20 Franklin County; but so little sense

or sentiment existed among some of the natives that several animals were trapped and shot in the fall of 1894, and the colonies would have been doomed to extinction but for the timely passage of protective laws. Following the enforcement of the law of 1895 a slight increase was noted, beaver signs being found along the Raquette river and reports indicated their presence at other points. The original five had increased by 1900 to about fifteen, some of the solitary individuals having been joined by a mate and started miniature colonies. In the fall of 1904, under the State appropriation for re-stocking the adirondacks with the mammals which originally were native, seven Canadian beavers which had been exhibited at the Louisiana Purchase Exposition in St. Louis, were liberated on the Fulton Chain. Other purchases followed and in all the State has introduced twenty beavers, while individuals have contributed fourteen, or a total of thirty-four. These, with the original stock, have increased until in 1908 it was estimated there were about 150, in 1910 over 300, and in 1912, including the young, there must have been at least 600, or an increase of 12000% in the seventeen years since 1895.

The return of the beaver to the Adirondacks is very noticeable to the observing summer visitor, because many of the colonies are on the banks of much frequented lakes and rivers from the Fulton Chain to the St. Regis country. Ten years ago none was in evidence save a few small colonies off the beaten paths. By 1906 beaver "signs" could be seen along the Raquette river below Indian Carry, and two years later the houses and "beaver slides" were quite noticeable at various points on the river. In the summer of 1912 beavers appeared to be plentiful along many of the well-known streams and lakes, including Big Moose, Raquette and St. Regis rivers, and Tupper, Long and Saranac lakes. Beaver have also recently appeared on Ampersand Lake near the foot of Mt. Seward, which indicates the early re-establishment of colonies in the wild undeveloped country at the head of Cold River, and around Mt. Marcy, and Mt. McIntyre. The number of houses seen probably gives an exaggerated idea of the number of individuals, since many of them

BEAVER "SLIDE"—A TRAIL LEADING BACK TO AN ASPEN RIDGE FROM WHICH HUNDREDS OF STICKS AND SMALL LOGS WERE DRAGGED TO THE RIVER. ON RAQUETTE RIVER IN THE ADIRONDACKS.

are abandoned after a year or two. Regardless of the number of individuals it is certain the present distribution of the beaver is over an area a million or more acres in extent, whereas fifteen years ago they were confined to one or two points in one township.

One of the interesting features of the present situation is the sagacity shown by the growing colonies in adapting themselves to conditions. It has long been observed that when the numbers become reduced and the struggle for existence keen, the families become "bank beavers"; that is, they give up

WORK OF BEAVER ON HEAD RIVER, SOMERSET COUNTY, ME.

building dams and canals and live in houses built along the stream banks. This has been the custom of the Maine and New York State beavers for years. With the return of numbers and prosperity there seems to be a tendency to revert to old habits, in methods of living and procuring a food supply. Whether the primal instincts will result in the same things being done by the new colonies when they return to a stream, as by their ancestors on the same location generations ago remains to be seen. If natural conditions were unchanged it might be argued that the present generation would have the same impulses as the colony which occupied the identical site a hundred years ago, the same as a different pair of birds each year may be impelled by common instincts to build on the same side of a certain tree, thus giving rise to the conclusion that the same individuals return annually to the old nesting place.

There was recently observed in the Adirondacks one of the first new beaver dams reported in the region in recent years. In the construction work, however, old precedents were broken because many of the sticks used were drift wood or cut by man and the dam itself was a repair job on an old log dam built in connection with log driving on a stream which flows into Cold River. The logs and sticks were floated down and distributed along the inside face of the old dam, and so effectively had they been piled and caulked with mud that the water level had risen to practically the height of the rebuilt dam.

Most authorities agree that the beaver in their natural state depend largely on their aquatic habits and accomplishments for protection against enemies. Dams are built to flood back the water over the entrance to the houses; canals are cut in which sticks for various purposes are floated; and even small streams are diverted or flat areas overflowed in order to bring the water nearer the sources of food and timber supply. Their lives and habits seem to be based on the fact that in the water they can give a good account of themselves, but on land they are at a disadvantage. In the Adirondacks the beaver have little to fear from man or natural enemies. The lynx, martin, wild cat and other animals that consider them easy prey are largely lacking, and because of this or for more obscure reasons the beaver, at least in their tree cutting, seem to be losing some of their natural fear of land operations. This tendency is not general and where aspens are plentiful most of the cutting is on stream banks as near as possible to the houses. It is when the local wood supply becomes depleted that

sticks are boldly dragged overland for considerable distances, instead of being floated down laboriously built canals or made accessible to water backed up by dams.

Where considerable cutting is done some distance back from a stream the sticks are all dragged out over a path which soon becomes smooth and more distinct than any deer trail. A colony which has been established at a point on the Raquette River for about four years was evidently forced in the spring of 1912 to move or derive their wood supply from an aspen ridge some distance from the stream. They chose the latter course and by August had practically cleared an area several rods square, cutting the stumps down to from four to fifteen inches of the ground and clearing up the tops in a way that would meet the strictest requirement of close utilization. The path or slide leading to the stream was some three hundred yards long, worn smooth at the lower end and entering the water through a tunnel, and dividing into several branches on the aspen ridge. A number of trees had been cut on the far slope and hauled up a steep grade to the summit of the ridge. So distinct were the paths and so openly and effectively had the work been done that several photographs which were taken clearly showed the slide, tunnel and newly felled trees.

The present sentiment is so strongly in favor of absolute protection that the existing colonies are practically safe from human enemies. Detection would almost surely follow any interference with the rapid increase now going on, and with enormous areas of State forest land available, on which fire is kept out and no lumbering done, the beavers are free to extend their range under almost ideal conditions for existence. The beaver will fit in well in most of our northern forests. The timber they cut is confined to aspen and willow, and the amount used practically negligible. Some damage is reported from Northern Michigan and Canada from the flooding of timbered land by beaver dams, but this is not likely to occur in the Adirondacks. As lumbering ceases in the virgin forests the cut-over non-agricultural land will become waste from forest fire, or under more enlightened state or government ownership will be held and protected for future forest crops, and on such areas the beaver will thrive.

For whatever purpose the northern forests are maintained, the beaver, if given a chance, will live his quiet life on the stream banks without serious harm or disturbance to anything. If they ever become abundant enough to justify a short open season a long lost commercial asset will be returned to the North Woods. For the present sentiment should rule, and to the hunter, tourist, or fisherman the woods will offer an added attraction if beaver houses become common on the stream banks, which were the habitat of prosperous thousands of the industrious animals before the white man came. The occasional glimpse of one of the animals or the surprise at the loud splash from the tail or a diving beaver in the dusk of evening will add spice to fireside stories of quiet hours on a deer run or the more active experiences on a successful fishing trip.

AN EXPERIMENTAL FARM.

The New York State College of Forestry at Syracuse has interested the Agricultural Department of the New York Central Railroad in the development of the forest resources of New York State. It has arranged with the Railroad Company to secure for demonstrational and experimental purposes the New York Central Experimental Farm No. 2 located immediately along the right-of-way of the Railroad at North Chittenango. Under the management of the College of Forestry this farm is to be known as the "Co-operative Forest Demonstration of the New York State College of Forestry and the New York Central and Hudson River Railroad Company."

YELLOWSTONE NATIONAL PARK

By Arnold Hague, U. S. Geological Survey*

THE Yellowstone Park is situated in the extreme Northwestern portion of Wyoming. At the time of the enactment of the law establishing this national reservation the region had been little explored, and its relation to the physical features of the adjacent country was little understood. Since that time surveys have shown that only a narrow strip about two miles in width is situated in Montana and that a still narrower strip extends Westward into Idaho.

The area of the park as at present defined is somewhat more than 3,300 square miles.

The Central Plateau, with the adjacent mountains, presents a sharply defined region, in strong contrast with the rest of the Northern Rocky Mountains. It stands out boldly, is unique in topographical structure, and complete as a geological problem.

The central portion of the Yellowstone Park is essentially a broad, elevated, volcanic plateau, between 7,000 and 8,500 feet above sea level, and with an average elevation of about 8,000 feet. Surrounding it on the South, East, North, and Northwest are mountain ranges with culminating peaks and ridges rising from 2,000 to 4,000 feet above the general level of the inclosed table-land.

South of the park the Tetons stand out prominently above the surrounding country, the highest, grandest peaks in the Northern Rocky Mountains. The Eastern face of this mountain mass rises with unrivalled boldness for nearly 7,000 feet above Jackson Lake. Northward the ridges fall away abruptly beneath the lavas of the park, only the outlying spurs coming within the limits of the reservation. For the most part the mountains are made up of coarse crystalline gneisses and schists, probably of Archean age, flanked on the Northern spurs by upturned Paleozoic strata. To the East of the Tetons, across the broad valley of the Upper Snake, generally known as Jackson Hole, lies the well-known Wind River Range, famous from the earliest days of the Rocky Mountain trappers. The Northern end of this range is largely composed of Mesozoic strata, single ridges of Cretaceous sandstone penetrating still farther Northward into the regions of the park and protruding above the great flows of lava.

Along the entire Eastern side of the park stretches the Absaroka Range—so called from the Indian name of the Crow Nation. The Absaroka Range is intimately connected with the Wind River Range, the two being so closely related that any line of separation must be drawn more or less arbitrarily, based more upon geological structures and forms of erosion than upon physical limitations.

The Absarokas offer for more than 80 miles a bold, unbroken barrier; a rough, rugged country, dominated by high peaks and crags from 10,000 to 11,000 feet in height. The early trappers found it a forbidding land; prospectors who followed them, a barren one.

At the Northeast corner of the park a confused mass of mountains connects the Absarokas with the Snowy Range. This Snowy Range shuts in the park on the North and is an equally rough region of country, with elevated mountain masses covered with snow the greater part of the year, as the name would indicate. Only the Southern slopes, which rim in the park region, come within the limit of our investigation. Here the rocks are mainly granites, gneisses, and schists, the sedimentary beds, for the most part, referable to the pre-Cambrian series.

The Gallatin Range incloses the park

OBSIDIAN CLIFF.

on the North and Northwest. It lies directly West of the Snowy, only separated by the broad valley of the Yellowstone River. It is a range of great beauty, of diversified forms, and varied geological problems. Electric Peak, in the Northwestern corner of the park, is the culminating point in the range, and affords one of the most extended views to be found in this part of the country.

The Absarokas rise as a formidable barrier on the Eastern side of the park, the Gallatins as a steep mural face on the West side, while the other ranges terminate abruptly, rimming in the park on the North and South, and leaving a depressed region not unlike the parks of Colorado, only covering a more extended area with a relatively deeper basin. The region has been one of profound dynamic action, and the center of mountain building on a grand scale.

The Central Plateau covers an area approximately 50 by 40 miles, with a mean altitude of 8,000 feet. It is accidented by undulating basins of varied outline and scored by deep canyons and gorges. Strictly speaking, it is not a plateau; at least it is by no means a level area, but a rugged country, characterized by bold escarpments and abrupt edges of mesa-like ridges. But few large vents or centers of volcanic activity for the rhyolite have been recognized, the two principal sources being the volcano to which reference has already been made and Mount Sheridan in the Southern end of the park. Mount Sheridan is the most commanding peak on the plateau, with an elevation 10,385 feet above sea level and 2,600 feet above Heart Lake. From the summit of the peak on a clear day one may overlook the entire plateau country and the mountains which shut it in, while almost at the base of the peak lie the magnificent lakes which add so much to the quiet beauty of the region, in contrast to the rugged scenery of the mountains. From no point is the magnitude and grandeur of the volcanic region so impressive. The lava flows—bounded on the East by the Absarokas—extend Westward not only across the park, but across the Madison Plateau, and out on to the great plains of Snake River, stretching far Westward almost without a break in the continuity of eruptive flows. Over the central portion of the park, where the rhyolites are thickest, erosion has failed to penetrate to the underlying rock. Even such deep gorges as the Yellowstone, Gibbon, and Madison Canyons have nowhere worn

Courtesy of Northern Pacific Ry. Co.

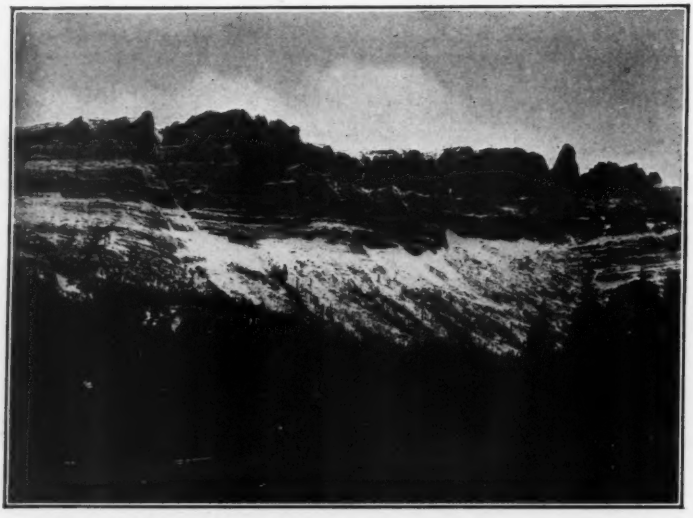
MT. WASHBURN ROAD ALONG CASCADE CREEK.

Courtesy of Northern Pacific Ry. Co.

GREAT FALLS AND GRAND CANYON FROM ARTISTS POINT.

through these rhyolite flows. In the Grand Canyon of the Yellowstone the andesitic breccias are found beneath the rhyolites, but the deepest cuts fail to reveal the underlying sedimentary beds. Although the rocks of the plateau for the most part belong to one group of acidic lavas, they by no means present the great uniformity and monotony in field appearance that might be expected. These 2,000 square miles offer as grand a field for the study of structural forms, development of crystallization, and mode of occurrence of acidic lavas as can be found anywhere in the world. They vary from a nearly holocrystalline rock to one of pure volcanic glass.

Since the close of the ice period no geological events of any moment have brought about any changes in the physical history of the region other than those produced by the direct action of steam and thermal waters. A few insignificant eruptions have probably occurred, but they failed to modify the broad outlines of topographical structure and present but little of general interest beyond the evidence of the continuance of volcanic action into quaternary times. Volcanic activity in the park may be considered as long since extinct. At all events indications of fresh lava flows within historical times are wholly wanting. This is not without interest, as evidence of underground heat may be observed everywhere throughout the park in the waters of the geysers and hot springs. All our observations point in one direction and lead to the theory that the cause of the high temperatures of these waters must be found in the heated rocks below, and that the origin of the heat is in some way associated with the source of volcanic energy. It by no means follows that the waters themselves are derived from any deep-seated source; on the contrary, investigation tends to show that the waters brought up by the geysers and hot springs are mainly surface waters which have percolated downward a sufficient distance to become heated by large volumes of steam ascending through fissures and vents from much greater depths. If this theory is correct it is but fair to demand that evidence of long-continued action of hot waters and superheated steam should be apparent upon the rocks through which they passed on their way to the surface. This is precisely what one sees in innumerable places on the Central Plateau. Indeed, the decomposition of the lavas of the



THE ABSAROKA RANGE ALONG THE EASTERN EDGE OF THE PARK.

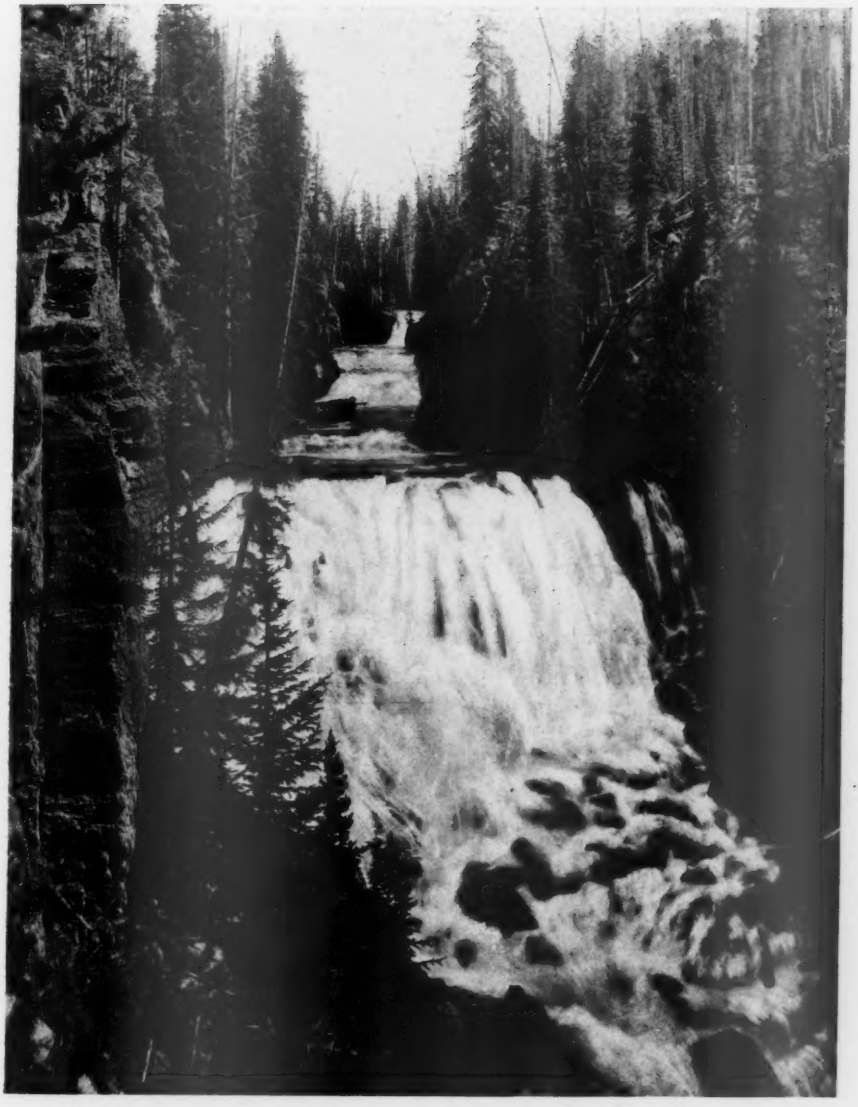
THE GALLATIN RANGE IN THE NORTHEASTERN PORTION OF THE PARK.

rhyolite plateau has proceeded on a most gigantic scale, and could only have taken place after the lapse of an enormous period of time and the giving off of vast quantities of heat, if we are to judge at all by what we see going on around us today. The ascending currents of steam and hot water have been powerful geological agents, and have left an indelible impression upon the surface of the country. The most striking example of this action is found in the Grand Canyon of the Yellowstone. From the Lower Falls for three miles down the river abrupt walls upon both sides of the canyon, a thousand feet in depth, present a brilliancy and mingling of color beyond the power of description. From the brink of the canyon to the water's edge the walls are sheer bodies of decomposed rhyolite. Varied hues of orange, red, purple, and sulphur-yellow are irregularly blended in one confused mass. There is scarcely a piece of unaltered rock in place. Much of it is changed into kaolin; but from rhyolite, still easily recognized, occur transition products of every possible kind to good porcelain clay. This is the result of the long-continued action of steam and vapors upon the rhyolite lavas. Through this mass of decomposed rhyolite the course of ancient steam vents in their upward passage may still be traced, while at the bottom of the canyon hot springs, fumaroles, and steam vents are still more or less active, but probably with diminished power.

Still other areas are quite as convincing, if not on so grand a scale, as the Yellowstone Canyon. Josephs Coat Basin, on the East side of the canyon, and Brimstone Hills, on the East side of the Yellowstone Lake, an extensive area on the slopes of the Absaroka Range, both present evidences of the same chemical processes brought about in the same manner. It is not too strong a statement to make to say that the plateau on the East side of the Grand Canyon, from Broad Creek to Pelican Creek, is completely undermined by the action of superheated steam and alkaline waters on the rhyolite lava. Similar processes may be seen going on today in all the geyser basins. A long period of time must have been necessary to accomplish these changes. The study of comparatively fresh vents shows almost no change from year to year, although careful scrutiny during a period of five years detects a certain amount of disintegration, but infinitely

UPPER FALLS FROM HOTEL WINDOW.

Courtesy of Northern Pacific Ry. Co.



Courtesy of Northern Pacific Ry. Co.

KEPLER CASCADE, JUST ABOVE UPPER BASIN, YELLOWSTONE PARK.

GLACIAL BOULDER NEAR GRAND CANYON.

small in comparison with the great bodies of altered rock. This is well shown in a locality like the Monarch Geyser in the Norris Geyser Basin, where the water is thrown out at regular intervals through a narrow fissure in the rock.

The Grand Canyon of the Yellowstone offers one of the most impressive examples of erosion on a grand scale within recent geological times. It is self-evident that the deep canyon must be of much later origin than the rock through which it has been worn, and it seems quite clear that the course and outlines of the canyon were in great part determined by the easily eroded decomposed material forming the canyon walls, and this in turn was brought about by the slow processes just described. The evidence of the antiquity of the hot spring deposits is, perhaps, shown in an equally striking manner and by a wholly different process of geological reasoning. Terrace Mountain is an outlying ridge of the rhyolite plateau just West of the Mammoth Hot Springs. It is covered on the summit with thick beds of travertine, among the oldest portions of the Mammoth Hot Springs deposits. It is the mode of occurrence of these calcareous deposits from the hot waters which has given the name to the mountain. Lying upon the surface of this travertine on the top of the mountain are found glacial boulders brought from the summit of the Gallatin Range, 15 miles away, and transported on the ice sheet across Swan Valley and deposited on the top of the mountain, 700 feet above the intervening valley. It offers the strongest possible evidence that the travertine is older than the glacier which has strewn the country with transported material. How much travertine was eroded by the ice is, of course, impossible to say, but so friable a material would yield readily to glacial movement.

Deposition of sinter from the hot waters of the geyser basins depends in a great measure on the amount of silica held in solution, which varies considerably at the different localities and may have varied still more in past time. The silica, as determined by analyses, ranges from 0.22 to 0.60 grammes per kilogram of water, the former being the amount found in the water of the caldron of the Excelsior Geyser and the latter at the Coral Spring in the Nor-

Courtesy of Northern Pacific Ry. Co.

MUD VOLCANO ON ROAD BETWEEN LAKE AND CANYON.

Courtesy of Northern Pacific Ry. Co.

TREE GNAWED BY BEAVERS, YELLOWSTONE PARK.

Courtesy of Northern Pacific Ry. Co.

YOUNG CUB BEAR IN TREE AT LAKE. NOTE MAN IN TREE BELOW THE BEAR FEEDING HIM SUGAR.

ris Basin. Analysis shows that from one-fifth to one-third of the mineral matter held in solution consists of silica, the remaining constituents being readily soluble salts carried off by surface drainage. A few springs highly charged with silica, like the Coral, deposit it on the cooling of the waters; but such springs are exceptional. At most springs and geysers it results after evaporation, and not from mere cooling of the water. It seems probable that the nature and amount of alkaline chlorides and carbonates present influence the separation of silica. Temperature also may in some degree influence the deposition. My friend, Mr. Elwood Hofer, has called my attention to an observation of his made in midwinter, while on one of his snowshoe trips through the park. He noticed that certain overflow pools of spring water, upon being frozen, deposited a considerable amount of mineral matter. He has sent me specimens of this material, which, upon examination, proved to be identical with the silica deposited from the Coral Spring upon the cooling of the water. Demijohns of geyser water which have been standing for one or two years have failed to precipitate any silica. Quite recently, in experimenting upon these waters in the laboratory, it was noticed that on reducing them nearly to the freezing point no change took place, but upon freezing the waters there was an abundant separation of free silica. The waters frozen in this way were collected from the Coral Spring, Norris Basin, and the Taurus Geyser, Shoshone Basin.

Again, there is no doubt that the algous growths flourishing in the hot waters of the park favor the secretion of silica and calcic carbonate and exert a potent influence in building up both the sinter and travertine deposits far greater than one might at first be led to suppose. These processes of assimilation are steadily taking place without interruption, as all algæ act as geological agents. The silica and lime brought to the surface by hot springs is, upon the death of the algæ, transformed into sinter and travertine, becoming rock masses, which later show scarcely any sign of their origin from plant life. Tourists are seldom aware that the harmonious and brilliant tints are due to vegetable growths. Algæ develop equally well in the waters of all geyser basins and upon the terraces of Mammoth Hot Springs. Water boils in the Upper Geyser Basin at 198 degrees F., and

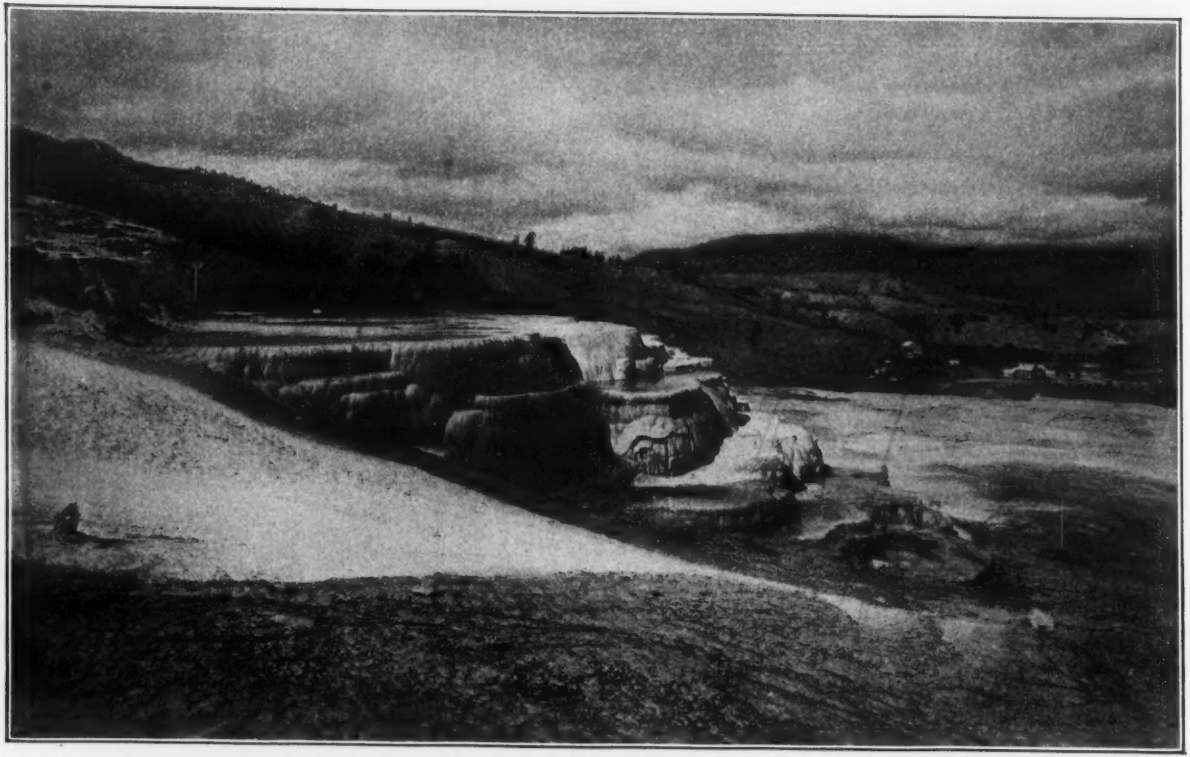
ALGAE BASINS.

BOWL OF GREAT FOUNTAIN GEYSER, LOWER GEYSER BASIN.

rudimentary organisms appear at about 185 degrees F., although no definite line can be drawn beyond which all life ceases. These low vegetable organisms occur in nearly all pools, springs, and running water upon the plateau. Wherever boiling waters cool to the latter temperature algæ make their appearance, and with the lowering of temperature on exposure to air still more highly organized forms gradually come in. It is believed that at about 140 degrees F. conditions are favorable for a rapid development of numerous species. Many forms of algæ flourish within restricted ranges of temperature, and the different species possess characteristic colors and habits of growth dependent upon such changes of temperature. After a little experience it is quite possible, upon noting the nature of the plant life, to make a sure guess as to the temperature of the water in which the species grow. As water in the geyser pools and caldrons frequently stands at or near the boiling point, no life exists at the centers of discharge, but with a rapid lowering of temperature algæ appear, with corresponding changes of color, in the shallow pools and overflow channels. In the geyser basins the first evidence of vegetation in an overflow stream consists of creamy white filamentary threads, passing into light flesh tints, then to deep salmon. With distance from the source of heat the prevailing colors pass from bright orange to yellow, yellowish green, and emerald, and in the still cooler waters various shades of brown. This, of course, is a simple statement of phenomena which really display highly complex conditions. No two pools or overflow channels are quite alike in their occurrence either as regards flow of water or development of algæ.

Several methods have been devised for ascertaining the growth of deposition of the geyserite. One way is by allowing the water to trickle over twigs, dried grasses, or almost anything exposing considerable surface, and noting the amount of incrustation. This way gives the most rapid results, but is far from satisfactory and by no means reproduces the conditions existing in nature. Other methods employed are placing objects on the surface of the water or, still better, partially submerging them in the hot pools, or again by allowing the water to run down an inclined plane with frequent intervals for evaporation and concentration.

The vandals who delight to inscribe

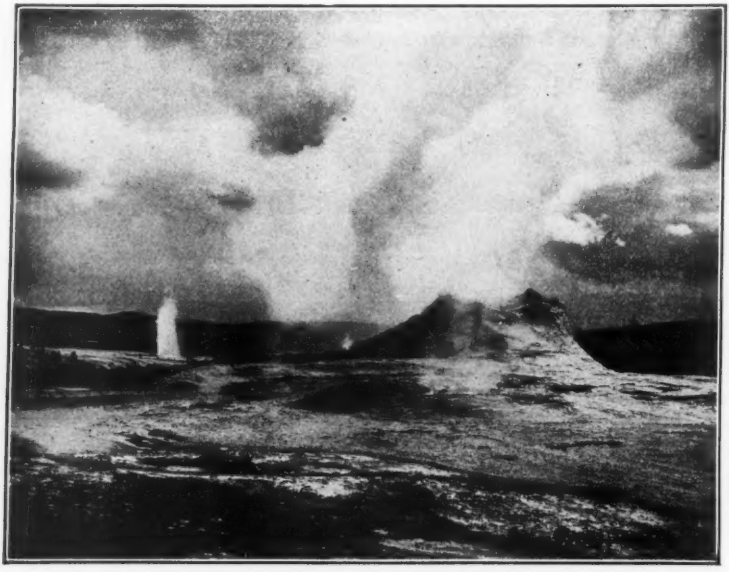


TERRACES AT MAMMOTH HOT SPRINGS.

Courtesy, Northern Pacific Ry. Co.

VIEW OF MAMMOTH HOT SPRINGS FROM JUPITER TERRACE.

their names in public places have invaded the geyser basins in large numbers and left their addresses upon the geyserite in various places. It is interesting to note how quickly these inscriptions become indelible by the deposition of the merest film of silica upon the lead-pencil marks, and, at the same time, how slowly they build up. Names and dates known to be six to eight years old remain perfectly legible, and still retain the color and luster of the graphite. That there is some increase in the thickness of the incrustation is evident, although it grows with incredible slowness. Mr. Weed tells me that he has been able, in at least one instance, to chip off this siliceous film and reproduce the writing with all its original distinctness, showing conclusively that a slow deposition has taken place. Pencil inscriptions upon the siliceous sinter at Rotomahana Lake, in New Zealand, are said to be legible after the lapse of 20 or 30 years. It is easy to see that various ingenious devices might be planned to estimate the rate of deposition, but in my opinion none of them equal a close study of the conditions found in nature, especially where investigations of this kind can be watched from year to year. All observations show an exceedingly slow building up of the geyserite formation. This is well seen in the repair going on where the rims surrounding the hot pools have been broken down, and where it might be supposed that the building-up process was under the most favorable conditions; yet, in a number of instances, I can see no appreciable change in three or four years. Revisiting hot springs in out-of-the-way places after several years' absence, I am surprised to see that objects that I had noted carefully at the time remain unchanged. Taking the entire area of the Upper Geyser Basin covered by sinter, I believe that the development of the deposit does not exceed one-thirtieth of an inch a year, and this estimate I believe to be much nearer the maximum than the minimum rate of growth. Supposing the deposit around Castle Geyser to have been built up with the same slowness as observed today, and assuming it to grow at the rate given—one-thirtieth of an inch a year—it would require over 25,000 years to reach its present development. This gives us a great antiquity for the



CONE OF CASTLE GEYSER, UPPER GEYSER BASIN.

geyserite, but I believe that the deposition of the siliceous sinter in the park has been going on for a still longer period of time. It is certain that the decomposition of the rhyolite of the plateau dates still further back.

From a geological point of view, there is abundant evidence that thermal energy is gradually becoming extinct. Tourists revisiting the park after an absence of two or three years occasionally allude to the springs and geysers as being less active than formerly and as showing indications of rapidly dying out. It is true that slight changes are constantly taking place, that certain springs become extinct or discharge less water, but this action is fully counterbalanced by increased activity in other localities. Close examination of the source of the thermal waters fails to detect any diminution in the supply. Moreover, it stands to reason that if the flow of these waters dated—geologically speaking—far back into the past, the few years embraced within the historical records of the park would be unable to indicate any perceptible change based upon a gradual diminution of the heat.

The number of geysers, hot springs, mudpots, and paintpots scattered over the park exceeds 3,000, and if to these be added the fumaroles and solfataras, from which issue in the aggregate enormous volumes of steam and acid and sulphur vapors, the number of active vents would in all probability be doubled. Each one of these vents is a center of decomposition of the acid lavas.

Changes modifying the surface features of the park in recent times are mainly those resulting from the filling up with detrital material of the valleys and depressions worn out by glacial ice, and those produced by the prevailing climatic conditions. Between the park country and what is known as the arid regions of the West there is the greatest possible contrast. Across the Central Plateau and the Absaroka Range the country presents a continuous mountain mass 75 miles in width, with an average elevation unsurpassed by any area of equal extent in the Northern Rocky Mountains. It is exceptionally situated to collect the moisture-laden clouds, which coming from the Southwest precipitate immense quantities of snow and rain upon the cooled tableland and neighboring mountains. The climate in many respects is quite unlike that found in the adjacent country, as is shown by the meteorological records, the amount of snow and rainfall being higher, and the mean annual temperature lower. Rainstorms occur frequently throughout the summer, while snow is quite likely to fall any time between September and May. Protected by the forests the deep snows of winter lie upon the plateau well into midsummer, while at still higher altitudes, in sheltered places, it remains throughout the year. By its topographical structure the park is designed by nature as a reservoir for receiving, storing, and distributing an exceptional water supply, not exceeded by any area near the headwaters of the great continental rivers. The Continental Divide, separating the waters of the Atlantic from those of the Pacific, crosses the park plateau from Southeast to Northwest. On both sides of this divide lie several large bodies of water, which form so marked a feature in the scenery of the plateau that the region has been designated the lake country of the park. Yellowstone Lake, the largest lake in North America at this altitude (7,740 feet) and one of the largest in the world at so high an elevation above sea level, presents a superficial area of 139 square miles, and a shore line of nearly 100 miles. From measurements made near the outlet of the lake in September, 1886, the driest period of the year, the discharge was found to be 1,525 cubic feet per second, or about 34,000,000 imperial gallons per hour.

*Extracts from a report by Mr. Hague.

LUMBERMEN AND FORESTRY*

By J. E. Rhodes

THE National Lumber Manufacturers' Association is a federation of practically all of the associations of lumber manufacturers in the United States, and represents a combined membership of about 1,500 of the largest saw mills of the country, having an annual output of over fourteen billions of feet of lumber. The lumber manufacturers have taken a general interest in forestry. They recognize that timber is being cut much faster than it is reproducing itself, and that necessarily lumber can be consumed at the present rate only a few years. It is now generally admitted by lumbermen that the climax of lumber production in this country has been reached and passed. There was a time when it was thought that the great white pine forests of the Northern States were inexhaustible, but the generation of the lumbermen now passing has seen the white pine forests nearly cut off. As they disappeared timber of other sections has increased in value. It is now believed that the climax of the production of yellow pine of the Southern States has been reached.

The evolution of economic conditions in the lumber business is, therefore, just beginning to make possible the consideration of forestry methods in practical logging operations. The lumber manufacturers admit (those of them whose operations will extend over ten years or more) that conservative methods must soon be applied to their business. With each material reduction in the output will come an increased value of standing timber, and when the price of stumpage has risen to the necessary point (and other conditions being favorable), scientific forestry will surely be adopted by lumbermen.

They are too intelligent business men not to undertake those methods which will perpetuate their supplies of raw material and thus prolong their business. If forestry cannot be undertaken with profitable results, it cannot be considered at all, as individuals cannot be expected to conduct a work of this kind at a loss to themselves no matter how much they may be prompted by sentiment or regard for future generations. The price of timber products must reach a point where it will pay to grow trees (or at least to conserve virgin timber), or forestry cannot be thought of. The time when forestry can be seriously considered by the lumbermen, therefore, depends entirely upon the development of economic conditions. The lumbermen generally appreciate that eventually the cutting of timber must be in proportion to its annual increase and growth, but they feel that that time is in the distant future.

Lumbermen resent the criticisms which have been made against them to the effect that they have wasted the nation's resources. They have utilized every part of the tree from which a profit could be realized. Much has been said about the reckless waste of our timber resources, but very little has been left in the woods to rot and burn which could have been saved. Men are not in the habit of destroying material from which any value can be derived. If anything has been wasted the public must share its responsibility with the lumbermen. As Mr. E. T. Allen says, "Cheap forest products and conservation are opposed propositions." As forest products have advanced in value, it has been possible for the lumbermen to utilize an increasing proportion of the raw material which he has found on the land.

The remarkable development of our country, cultivated and settled in a century and a half, could not have been accomplished without the sacrifice of the forests, providing as they have the

cheapest building material ever known. We may ask if the results have not justified the sacrifice. Homes, cheap, compared with those obtainable under any other conditions, have been furnished to millions of people and great areas of country originally covered with the forests are now producing annual farm crops of more value every year than all of the trees they replace.

Lumbermen make a distinction between reforestation (or the planting of a new crop of trees) and scientific forestry methods as applied to logging operations. Scientific forestry, in logging virgin timber, as we understand it, means the cutting of the existing forest so that it may have a chance to reproduce itself. This involves the cutting of trees of certain species by diameter limits, leaving the young timber where under certain conditions it may be expected to increase in size, leaving also matured trees for seeding purposes, ascertaining the rate of growth of certain species in different localities, knowledge of the exact relation between forest growth and lumber consumption, and many similar subjects, all of which the lumbermen are willing to admit must be worked out by the technical forester.

Scientific forestry methods along the lines suggested mean large additional expense compared to the present manner of cutting timber. This increased cost must, of course, be borne in the end by the consumer, and just as soon as the consumer is willing to stand it, I state again that these emethods will be gladly undertaken by the lumbermen. Cheap virgin timber is becoming hard to find. Nearly all of the merchantable timber on the North American continent, with the exception of large tracts in Mexico, has been purchased. For this reason, many timber owners are looking forward to the day when it may be possible to put what forests they now own upon a permanently paying basis by cutting it in proportion to its growth. In endeavoring to figure out what can be done that timber properties may be operated with the view of securing another crop, lumbermen are confronted with those two great obstacles,—fire and taxation.

The present system of taxation is an absolute barrier against the adoption of any forest principles whatever. This fact is exceedingly discouraging to those timber owners who would like to perpetuate their supplies of forest material. Certainly no progress can be made so long as our forests continue to be taxed under the general property tax system. The price of standing timber has not yet reached a point where forestry methods can be practiced upon a large scale even if there were no taxes, but lumbermen confidently expect that prices will reach such a point before many years, and they are confronted with the question of what kind of a tax they can pay, and adopt conservative cutting and still leave a reasonable profit on the investment. The public must understand that private forestry on a scale sufficiently large to insure an adequate supply of lumber in the future, must present some inducement as a business proposition, or it never will be undertaken. It is useless to expect men to look at it from any other way. There will have to be a radical change in the present methods of taxing timber lands in this country, and this can be brought about only by the education of the people. It is at this point that the foresters and the lumbermen will get together. The lumbermen feel that the foresters alone can show the public that nothing can be done toward preserving the nation's resources so long as the forests continue to be taxed on the basis of an annual crop. The farmer harvests his crop once each year, while the lumberman harvests his only crop once in the average lifetime. Under the annual tax system holding young timber until it reaches maturity has meant financial loss to all who have undertaken it. While many thinking people recognize this fact, it is to be regretted that, so far, the public generally has opposed any change in the present plan of taxing timber lands. No organization in the United States can exercise a greater influence toward the right method of taxing timber lands than can the American Forestry Association. Various plans for collecting a tax upon the timber after it is cut have been suggested, and none of these would be seriously opposed by the lumbermen,

except that those lumbermen who have given the matter any consideration believe that lands which are better suited for the growing of farm crops than of trees should never be exempted as forest lands for the reason that the returns from the farm lands would be as much each year (or each two or three years) as the returns from the same area of forest lands after many years.

This question of the reform of taxation of timber lands is a very large one, and the lumbermen believe that it will come about very slowly, but they feel that the perpetuation of the timber supply in this country depends upon its solution.

Reforestation, or the planting of a new crop of trees upon cut-over or barren lands not suitable for agriculture, the lumbermen believe must be done by the state and national governments. This is a work which cannot be considered by the present generation of men as a profitable enterprise or investment, except in a very minor way, as the returns to be expected are inadequate and success too uncertain. The length of time to plant and mature a profitable crop of timber is too great to interest Americans. It is certain that the individual must pay taxes in some form or other while the state is exempt. The actual planting of trees from the seed for the benefit of future generations, if it is done to an extent sufficient to insure a future supply of lumber, in anything like adequate volume, must be done by the State or government. The lumbermen are not opposed to the efforts being made by the federal government or by any of the states to preserve the timber lands publicly owned. They are almost unanimously opposed to the federal government transferring any of the national forests to the states in which they are located. In many localities lumbermen are taking a leading part in the movement to encourage the state governments to acquire and maintain state forests.

Next in importance to taxation, the future of forestry in America depends upon reducing the enormous loss from forest fires. The lumbermen have taken a most commendable part, especially in the western states, in the efforts to reduce this enormous loss. They have co-operated actively with the government and state officials to reduce the number of forest fires, and very satisfactory results have been obtained during the last three years. If time permitted, I could explain at length the work of the various forest protective associations of the western states in which the lumbermen are the prime movers, and also of their efforts to secure the enactment of forest protection laws by various State Legislatures. No opportunity is being lost by the lumbermen to impress every man, woman and child with the truth that every tree which burns is a direct menace to the community. The time is near at hand when the great annual losses from forest fires in this country will be reduced to a minimum.

The lumbermen generally are looking to agencies like the American Forestry Association to work out these problems for the benefit of the future. They are broad-gauged American citizens, ready to do their full share, and as soon as there is a sane taxation of timber lands, and adequate protection from fire, lumbermen will apply scientific forestry methods to practical logging operations. Obviously, progress in this direction will accompany and be in proportion to the increase of value of timber lands.

* An address at Asheville, N. C., March 25, 1913, at the spring meeting of the directors of the American Forestry Association.

KANIKSU FOREST SALE.

Bids for 267,000,000 feet of timber on the Kaniksu National Forest, Idaho, made by the Fidelity Lumber Company and the Dalkena Lumber Company, both of Newport, Washington, have been accepted. This sale will, when formally signed up, raise the total amount of National Forest timber sold by the Government during the current fiscal year to approximately two billion feet. The largest total of sales in any previous fiscal year was only slightly over one billion feet, so that with three months yet to go this year is certain to establish an exceptional record of timber sale activity.

ADDITIONS TO EASTERN NATIONAL FORESTS

By Wm. L. Hall, Assistant Forester, Forest Service

In approving the purchase of 72,000 acres of land for national forest purposes in New Hampshire, North Carolina and Tennessee on April 9, the National Forest Reservation Commission takes another step in working out the policy of Eastern national forests. At meetings held during the past winter the Commission in some cases approved large acreages made up of small tracts. In this case but three tracts are included in the approved purchases.

WHITE MOUNTAIN LANDS

In the White Mountains an addition of 7,500 acres is made in a tract located upon the West slope of Mt. Moosilauke and on the watershed of the Connecticut River. For more than a year the Government has had this purchase, together with others in that locality, under consideration. But due to one difficulty after another negotiations were not completed until very recently. The tract includes the Western slope of the Southern peak of Mt. Moosilauke which is the prominent feature of the Southwestern portion of the White Mountain area and is much visited by the tourists and pleasure seekers who frequent the White Mountains. Proximity to the railroad and the presence of several good roads make all parts of the tract very accessible. A small part of the tract, 180 acres, consists of a stand of virgin spruce timber averaging some 15 cords per acre. Thirty-five per cent, or 2,468 acres, is covered by a stand of hardwoods from which the best trees were removed about twenty years ago. The openings thus made have filled in with young trees so that at the present time a good stand of young spruce and balsam is mixed with the old trees which were left. On this portion of the tract the stand is 10 cords per acre. Fifty per cent of the tract, or 3,750 acres, is completely covered with second growth stands of spruce and hardwoods from 50 to 75 years old. This stand came up after clear cuttings were made near the railroad and on old fields which were abandoned many years ago. It is very dense and in thrifty condition and contains about 10 cords of merchantable timber to the acre on the average. The remainder of the tract consists of old fields in process of returning to timber, of areas cut over in recent years and other unmerchantable growth.

In order to put this tract into the best growing condition some cutting ought to be done soon to remove the mature and defective trees which are now holding back the young and more vigorous growth, over rather large portions of the tract.

MT. MITCHELL LANDS

In the Mt. Mitchell purchase area in North Carolina a tract of 11,150 acres, situated on the East slope of Mt. Mitchell, was approved for purchase. This tract forms the extreme headwaters of the South Toe River, the waters of which flow into the Tennessee, a stream of great navigable importance. The tract contains a valuable stand of hardwood and hemlock timber and is near enough to the railroad to be available for present logging. The examination made by the Forest Service, however, shows the presence of much young timber just above merchantable size on many portions of the tract. It would be unwise to cut this timber at the present time. It should be held for ten or fifteen years in order to benefit by the present rapid growth which is taking place.

This particular tract has not been greatly used by the public, but it comes within one and a half miles of the sum-

mit of Mt. Mitchell, which is well known and visited each year by hundreds of tourists. On this tract there flourishes a novel local industry—that of gathering galax leaves for the market furnished by Northern florists. The galax leaves are picked by the local families, usually by women and children, bought by the local storekeepers and shipped to the Northern cities. During the last few years this industry has had a very beneficial effect upon the tract in preventing fires, since the local people are much interested in seeing to it that the galax beds are not injured by fire. It is interesting how small a feature may modify local sentiment in regard to forest fires.

TENNESSEE LANDS

In Polk County, Tennessee, is situated a tract of 53,000 acres which was the third tract approved for purchase by the Commission. This is the first purchase made in the so-called Cherokee Purchase Area. The Louisville and Nashville Railroad from Knoxville to Atlanta runs through or nearby this tract for thirty miles and makes it quite accessible from either of the above cities. Tourists and pleasure seekers have used this tract very little, for in recent years there has been nothing to attract them. Unfortunately it lies within a zone in which timber for a number of years was much injured by sulphuric acid fumes from the copper smelting plants at Ducktown and Copper Hill, Tennessee. These plants emitted sulphur fumes of such density as to almost obliterate vegetation within a radius of four to five miles and to do considerable damage to forest trees for a distance of 20 to 25 miles. On the tract which is being purchased the greatest damage has occurred on the high slopes and ridges since the fumes seemed to strike those points more severely. Some three years ago the copper companies installed plants for converting the waste product into sulphuric acid, so that now the damage done by the fumes is much reduced, if not negligible, and there is already a noticeable recuperation on the part of the forest. However, much of the white pine, chestnut oak, black oak, and chestnut have either been killed or are damaged so that they will never overcome the injury. On the other hand, certain valuable species, such as yellow poplar, red oak and yellow pine, are but little injured.

The ridges on this tract are of rounded configuration and are covered by a soil of considerable fertility and in most places comparatively free from stone. As the timber has been thinned out by the fumes and fires which have come on account of the increased amount of dead timber, a growth of grass has sprung up on these ridges until now there are probably seven or eight thousand acres of good grazing land and the portions covered by grass are probably as valuable now as they were when covered by timber.

Some thirty per cent of this tract has been cut over and is bought in that condition. On account of the damage from fumes and the cutting which has been done the value of this tract is below the average for good forest land in the Southern Appalachians, and a corresponding reduction in price was secured in the purchase. This new area will be placed under protection and administration as soon as possible in order that fires may be prevented and the tract again be put into good growing condition.

All of the tracts approved will be surveyed as quickly as possible and while the survey is in progress the titles will be examined so that the Attorney General may pass upon them as is required by law. Due to the difficult survey work in both the Southern Appalachians and White Mountains and the many title complications which exist it can hardly be expected that most cases will be completed so that payment can be made within less than six months to a year from the time of approval by the Commission. In numerous cases it has been found that the titles are such as not to be considered safe by the Attorney General and condemnation proceedings are necessary in order for the Government to obtain a safe title.

RECENT CONSERVATION LEGISLATION IN VERMONT

By A. F. Hawes, *State Forester*

THE biennial session of the Vermont Legislature, which has recently come to a close, has been one of exceptional progress as regards the conservation of natural resources, as well as in other important policies. In forestry matters particularly the influence of the educational campaign was plainly evident in the favorable attitude of the great majority of both Houses.

Perhaps the most far-reaching act, from the standpoint of the development of the State along all lines, was a provision for continuing the topographic survey of the State. Several years ago, when the Geological Survey bore the whole expense of such work, about one-third of Vermont was mapped, but nothing has been done of recent years toward completing this valuable work. Through coöperation of the State Geologist, State Highway Commissioner, State Forester, the various colleges, the Green Mountain Club, and the Automobile Association, an annual appropriation of $2,000 for the next two years was obtained to offset a similar sum to be furnished by the United States Geological Survey.

Of the new laws the most important, from the purely forestry standpoint, is a law relating to the taxation of young timber. Vermont may fairly congratulate herself on being the third State to pass legislation of this nature. This law provides that the following classes of land may be specially classified under this law: cut-over or other land fully stocked with forest trees not more than fifteen years old, except scattered trees, the presence of which does not increase the assessed value of the property; cut-over or other land incompletely or partially stocked with forest trees not more than fifteen years old when planted with a sufficient number of additional trees to assure a spacing of approximately six by six feet over the entire area; and open land planted with forest trees not less than one thousand to the acre, "provided they are species approved by the State Forester, and provided further that the land is outside the limits of cities and villages. Application for classification is made to the State Forester and will require an examination by his office before approved. Lands so classified "shall thereafter be taxed annually at the local rate on a valuation of the land alone, said valuation to be established by the local listers at the time of classification, but in no case to exceed three dollars an acre, said valuation to be maintained until 1950. In the year 1950 the land alone shall be revalued without regard to the above limit, and the valuation then established shall be maintained for a further period of fifty years." "Whenever a commercial cutting is made a tax of 10 per cent shall be levied on the gross stumpage value of the amount cut." Use of the land for pasture, destruction by fire of the tree growth and failure of the owner to restore forest conditions or any other changed conditions which, in the opinion of the State Forester, indicates that proper forest conditions are not being maintained, shall be considered sufficient grounds for cancellation of classification." The yield tax mentioned above is to apply to "all products cut except material cut for domestic use and which is not to be sold, or material removed in the form of thinnings to improve the conditions of the remaining stand, and whose stumpage value does not exceed the cost of removal." There is also some further machinery provided for carrying out the provisions of the law.

The law which has long been on the statute books providing an exemption of ten years on forest plantations, and which has been wholly ineffective, is

hereafter to apply only to land planted prior to January 1, 1913.

The law described above was intended primarily to encourage reforestation, although it will eventually discourage the cutting of immature timber. It was realized that additional legislation was needed applying immediate remedy to this latter trouble, and a bill was drawn up following somewhat closely a bill advocated by the Connecticut Board which investigated this subject. Although the matter was brought up late in the session, through the urgent advocacy of Mr. W. H. Taft, the representative from Townshend, it was passed on the last day of the session.

This law applies to forest growth over fifteen years of age, thus supplementing the other law. Anyone owning such growth may have it specially classified under this law, and when so classified it shall be taxed according to the last preceding quadrennial appraisal, and no raise shall be made in the appraisal until the year 1950, when it may be revalued. According to Vermont law all real estate is appraised every four years, and in order to be perfectly fair to the towns, this law is not to take effect until January 1, 1915, thus allowing a quadrennial appraisal to intervene. The value established at that time, therefore, on land and timber, will remain the assessable value of all land up to 1950, classified under this law previous to the next appraisal, etc. This does not in any way cut down the income of the forest towns, but it assures the owner that his taxes are not raised every four years as they have been of late. As he will have paid an annual tax on the land and timber, the only additional yield tax imposed at the time of cutting is a tax on the increase of the value of the timber between the time of classification and the time of cutting. For this purpose an additional tax of one-tenth of one per cent per annum for the period the land has been classified, is levied on the gross stumpage value of the timber cut. For example, if the land has been classified twenty years and 100,000 feet of lumber is cut, worth $6 stumpage, the additional tax paid would be $12.

It is expected that eventually most of the forest lands of the State will be classified under these two laws. Timber lands first classified under the second law, will naturally be reclassified under the first law as soon as they are cut-over and reproduced. Of course many modifications will suggest themselves as the laws are tried out. One such amendment will be necessary to encourage such systems of silviculture as the shelter wood system, or any system where reproduction is secured under old growth.

The policy of State forests has now been definitely adopted by Vermont through the action of the Legislature in making an annual appropriation of $7,500 for the purchase of lands for forest purposes; their survey, and for reforesting such portions of them as are suitable for planting. Governor Fletcher suggested an appropriation of $10,000 for this purpose, but through the unfortunate opposition of some so-called Progressives, the amount was cut to the figure mentioned above. This will, however, be sufficient to carry on the educational work through demonstration forests in various parts of the State. It was encouraging to note that the strongest backing in the Legislature came from sections where such forests had already been established.

A much-needed improvement was made in the forest fire law. Under the previous law the first selectman in each town has been fire warden. These men are often not well situated for this work, and on the other hand, when one did well he could not be continued beyond the year. The new law provides that the selectmen shall appoint a fire warden by January 1, who shall be approved by the State Forester. If this appointment is not made by March 1, the State Forester may himself make the appointment. Men engaged in fire fighting will hereafter be paid for such services at the same rate as the town allows for work on the highways, instead of the fixed price of $1.50 per day which, in many towns, is too little. Provision is also made in the new law that when a warden takes men into an adjoining town the bill shall be paid by the town in which the work was done. If a town neglects to pay such a bill,

and it is approved by the State Forester, it may be paid by the State and collected from the town.

Another law gives the State Forester authority to erect such buildings, lookout stations, etc., as may be desirable on the State forests, the same to be paid for out of the general forestry appropriation.

The advent of the brown-tail moth in scattered regions throughout the eastern part of Vermont has made the suppression of forest insects a live problem, and the Legislature very wisely provided that the Commissioner of Agriculture could draw upon the State treasury for this work such sums as were necessary for controlling the pest.

Other lines of conservation received considerable attention at the hands of the Legislature. One of the subjects of particular interest in Vermont is the distribution of electrical energy made from water power. The new law compels power companies in the State to furnish power at reasonable terms to meet the local demands. This is to protect the State against the exportation of power needed for internal development, but does not prohibit its export.

The advanced legislation above described is very largely due to the progressive policy of Governor Fletcher, who has long been interested in forestry. He was one of the original members of the Vermont Forestry Association, and at its last annual meeting was elected president. As a member of the House of Representatives, several years ago, Mr. Fletcher took a prominent part toward securing the first small annual appropriation of $500 for a State nursery, and in formulating the forest fire laws. In 1908 he was again in the Legislature and helped in the movement for securing a State Forester and the general forestry appropriation. As chairman of the Ways and Means Committee of the House in 1910, he secured a joint appropriation for forestry and agriculture which put both branches on an effective basis.

Although a native of Indiana, Governor Fletcher has long resided on the farm of his ancestors in Cavendish, Vermont. The contrast of the hilly Vermont lands to the level lands of Indiana made him an easy convert to the idea of timber raising as one of the chief industries of the State, and the forestry movement owes him a deep debt of gratitude.

NEBRASKA FOREST LAND ELIMINATED

BEGINNING October 1, the end of the present grazing season, the North Platte division will be eliminated from the Nebraska National Forest. This area will then be open for settlement and entry under whatever conditions the Secretary of the Interior may impose. The North Platte division, which lies in Grant and Arthur counties, contains nearly 350,000 acres.

When the original boundaries of the Nebraska Forest were established they included a great deal of public land which at that time was not considered available for agriculture. The recent developments of dry farming have demonstrated that some of this land can be cultivated with profit. As a result of this demonstration and of a study by the experts of the Bureau of Soils, in co-operation with the Forest Service, the land will become available for homesteads.

The soil experts say that approximately thirty per cent of the area is suitable for farming, in spite of the fact that it is in what is locally known as the sandhill region. There is no present stand of timber, and it was first proclaimed as a part of the National Forest with the idea that trees could be made to grow there through artificial planting.

At the present time the land is occupied by stockmen under grazing permits from the Forest Service. It is for this reason that the time of elimination has been set forward to October 1, although the proclamation was issued by President Taft the day before he left the White House.

DEMANDS OF THE NATIONAL FORESTS FOR TECHNICAL WORK AND TRAINED MEN

By W. B. Greeley, *Assistant Forester*

A FEW weeks ago I was on the Sierra National Forest as a member of the Marking Board of the Forest Service in California. It was our duty to determine the methods of cutting to be used in a large sale of lumber. We chained off strips through one of the magnificent forests of sugar pine, yellow pine, and fir on the headwaters of the San Joaquin River, designating the timber to be cut because of old age or disease and determining what trees should be retained to restock the land after logging and make further growth before harvesting. This was the final step in two years' work on the forest management of a watershed of some 50,000 acres. First a detailed map of the area and estimate of its timber were made. The ripeness of the timber for cutting and the amount which should be removed were ascertained. The engineering features of developing the watershed, the route and cost of 75 miles or railroad, the methods and cost of logging, and the market value of the products to be cut were determined. The next step was to work out the business features of exploitation, the prices to be paid for the timber, and the terms of the sale contract. Finally the Marking Board made its silvicultural study of the various types of forest, chose the methods of cutting and applied them concretely on sample areas. All of this work is now embodied in the clauses of a timber sale contract involving over $1,600,000 worth of Government stumpage. Upon it will be based an investment in mills and equipment of nearly $2,000,000, and a lumbering operation cutting forty million feet annually for 22 years.

Over two years of technical work was necessary before any of these things could be done. But our task on this area has just begun. The results of these studies must be applied in directing cutting and logging through the 22 years of the contract which the Government has now made. And it will be twice or thrice that time before the aims sought in the broader features of forest management on this watershed can be accomplished.

For many years the national forests were simply lines on a map. Then their protection began and the use of a few of their most accessible and easily developed resources in a temporary way. The forests are now entering a period of intensive use of a permanent kind. This use is extending to all of their resources, including those inaccessible and developed only at a high cost.

Intensity of use of the national forests and increased demands for technical work go together. One is not possible without the other. We must develop the timber, range, and waterpower as permanent producers of wealth under public control. We must adjust conflicting interests like timber cutting with watershed protection or the renewal of tree growth with stock grazing. We must determine the extent and interrelation of the many influences exerted by the forests. These duties involve many problems as yet unattacked by American science or business. With the demands for immediate development, such problems are crowding upon us. Constructive technical work is essential for their solution. It is one of the greatest needs of the forests today. It must be conducted with painstaking care, step by step. We are dealing with two billion dollars worth of public property. The principles and methods applied to its exploitation must be established with scientific certainty. Both preliminary

investigations and plans of work embodying their results must be extended over long periods of time. Without such technical work you must face the alternative of leaving the forests as great, unused preserves contributing nothing to the economic needs of the Nation, or of exploiting them loosely with inevitable waste and risk of early depletion.

In discussing any question touching the control of the national forests it is essential to consider the kind of technical work which must be done, the kind of men who must do it, and the ends which are sought by these means.

The first and greatest technical problem on the forests is to put their timber to use under scientific methods which insure a permanent yield and the best disposal of the product. Near the central Montana forests a permanent copper mining industry must be supplied. Its demands are large. It has required an intensive inventory of the timber within practicable distance and a determination of the growing capacity of the forests. It has necessitated detailed studies of methods of cutting and reproducing stands of lodgepole pine. The result of this work will be the blocking out of definite areas which will yield perpetually the thirty million feet or more required annually by this industry and the preparation of logging plans for their systematic cutting, unit by unit, over a period of from 60 to 100 years. On the Whitman National Forest in the Blue Mountains of Oregon a plan of exploitation has been developed by several years' work under which four sawmills will soon be cutting from forty million to sixty million feet annually. Logging units have been mapped out which will supply these mills for at least 20 years. Scientific study of the methods of cutting and reproducing yellow pine was a vital feature of this plan. Here, in the face of a local demand for timber beyond the capacity of the forest to supply, a definite plan of exploitation has been prepared and put into effect which will permit the cutting of the maximum amount of timber annually consistent with maintaining the permanency of the forest and hence of the industries built up upon it.

These are illustrations of what must be done on hundreds of other units making up the 600,000,000,000 feet of stumpage on the National Forests. We must have plans of scientific management covering engineering development, logging methods and costs, the methods of cutting applicable to each type of forest, and the future yield obtainable under them. One by one, these units will thus be reclaimed from unproductive pieces of virgin wilderness and made to yield the maximum amount of forest products through scientific exploitation which they are capable of maintaining permanently. The total annual yield which can thus be produced for all time is roughly estimated at 6,000,000,000 feet. With the right kind of scientific treatment the forests should be made to yield 8 or 9 billion.

All this demands intensive study of many phases of technical forestry. The hitherto unknown science of silviculture in the western United States must be developed. Five experiment stations have been established on the National Forests for this purpose. They are conducting tests of many different methods of cutting on sample areas where the results of each may be ascertained periodically by exact measurement. Many years must elapse before conclusive data from such experiments can be obtained, but this is the only way to solve some of the problems on hand.

Of almost equal importance is the reforestation of denuded areas in the National Forests which are adapted to growing timber but now are idle. This must begin with intensive study of the technical problems involved. Growing young trees is difficult in many of the semi-arid portions of the West. The fundamental soil and climatic factors to be dealt with are being worked out at experiment stations and test nurseries in every section where reforestation is urgent. Methods of wide range are being tried on a small scale. Many of these tests will require from five to ten years for conclusive results. But again, this is the only way to attack a big problem.

As methods of reforestation are developed by study they must be applied on a large scale. It has taken many years of investigation and experience to find out how to collect and extract large quantities of tree seed cheaply and effectively. We are now using 75,000 pounds a year for sowing denuded lands on the Forests. A number of large nurseries have been developed. They are now producing 10,000,000 young trees annually. The selection of areas to be planted, and of the species and methods to be used on each, call for the best technical training seasoned by experience. There are 7,500,000 acres of denuded lands in the National Forests which must be restocked by artificial means. The idleness of this land is a great National loss. Its restoration to timber production is one of the biggest and most far-reaching pieces of technical work to be done on the Forests. But it is work which can only be made successful by painstaking investigation and the gradual application of results under plans extending over long periods. At best, its completion will be a 70 or 80 years' task. It will require an outlay of 40 or 50 million dollars on which returns will be slow. If the American people permit the completion of this work to be interrupted or abandoned through changes in policy o rin the control of the Forests, their possible timber supply of the future will be cut down a billion feet a year.

In a broad survey of the technical work to be done on the National Forests we must not lose sight of their importance for other purposes than the production of timber. The extent and economic importance of less direct influences exerted by the Forests must be determined. This is essential to guide both local administration and general policy intelligently. The relation of forests to streamflow and floods is now under intensive study, in co-operation with the Weather Bureau, at two experiment stations in the Rocky Mountains. Many years will be required to bring this study to a final conclusion. But it is imperative for the country to know these factors in terms approaching mathematical exactness as closely as possible.

The restoration of worn-out stock ranges and the improvement in the quantity and quality of the forage produced on the Forests is another field for technical work which must be utilized to the full if these resources are to serve the country as they should. Roughly speaking, it will be possible by this means to increase the forage value of the National Forests at least 20 per cent. Here, again, intensive study by exact scientific methods is fundamental before work on a large scale can be attempted. The investigation of this problem is now centered at an experiment station in central Utah established for this specific purpose.

The study of water powers on the National Forests and the devising of ways and means of putting them to use under terms which are practicable for the private investor, and yet insure adequate public control, call for a high degree of technical engineering skill. The same is true of adjustments between conflicting uses of streams so as to provide for the maximum development of the resources of a Forest as a whole. On many of the larger rivers in the Northwest power development must be adjusted to the use of streams for driving logs, or both to the construction of needed railroads. Like the scientific management of timber lands, these problems must be solved by trained experts if the public resources are to be made of the greatest use of which they are capable.

The solving of these problems and the application of the results obtained are not matters of a few months or a few years. It is a big public task reaching far into the future. It calls for consistent correlated effort in many different regions and extending over long periods. But upon the solution of these problems and the intelligent application of results depends very largely the permanent value of the resources contained in the National Forests to the people of the United States.

The accomplishment of this big task depends upon two things: First, upon the steady efforts of a staff of trained experts, working continuously under assured conditions and adding to their capacity year by year through enlarged

experience; second, stability in the organization of the National Forests and in the policies followed in their administration.

Like most branches of Government work, the National Forest Service does not offer large remuneration to the men who enter it. It does, however, attract men who find keen satisfaction in the discovery and application of scientific principles and in service to the public. The best men available must be had for this work. Exacting standards as to technical qualifications must be enforced. The conditions governing their work are often arduous and uninviting. Such men can be obtained, they are now being obtained, because of the stimulus of scientific work of direct and far-reaching value and because of the opportunity of participating effectively in a big movement for greater National efficiency.

The trained men needed on the National Forests, the men now at work on them, can be retained only under assured and stable conditions of employment. This means not only the maintenance of an inviolate Civil Service; not only promotion for merit exclusively; not only protection from adverse political or business influence; not only a life-long opportunity for effective work to which these things are essential. They must know that their work is going to count; that well-laid plans extending over many years will be carried to fulfillment; that scientific principles developed by painstaking study will be put to use; that no disruption of policy or change of control will bring to naught the work to which they have laid their hands.

Aside from this fundamental question of a trained personnel, the demands of the National Forests for technical work can be met only by stability in the aims and policies governing their administration, and hence by stability in the agencies charged with their administration. The growing of trees at best is a long-term proposition. Plans for the management of large areas of forest are made in terms of decades or quarter centuries. Eight recent timber sales have been approved on the National Forests under which cutting will be conducted for periods ranging from 10 to 22 years. Each of these sales has been made in accordance with a definite plan of management designed to accomplish specific results in the exploitation and improvement of a Forest unit. The making of a sale is but the first step. It is far more important that the plan of management, of which the sale is one feature, the methods of cutting which are contemplated, and the restocking and improvement of the area which are sought be actually carried out to completion. Many reforestation projects and technical investigations now started on the National Forests will be, or should be, of equal duration. Nothing could be more fatal to the administration of the National Forests in terms of concrete results than the disruption of technical plans and methods of management after the bare foundations have been laid. Shifts in policy would not only mean a direct loss of the effort and money expended in initiating such work. They would make it impossible to obtain any definite or conclusive results in the scientific development of the Forests.

Furthermore, the administration of the National Forests must seek the best solution of all of their technical problems from the standpoint of permanent usefulness of the resources which they contain. It must to a large degree be independent of immediate profits. It must be willing to invest large sums in order to find out how these resources can be used to the best advantage and to develop latent resources which may not pay returns for many years. The Forest Service is now spending some $300,000 annually for the reforestation of denuded lands, and over $75,000 for technical investigations on the Forests. It will be a long time before we can show financial returns from these expenditures. Yet they are absolutely essential if we are to get what we should get out of the National Forests in the long run. To do this technical work in the first place, and to make effective use of its results in the second place, stability in the control and administration of the Forests is vital.

The National Forests present one of the greatest opportunities which any

people ever had to utilize vast resources of their own for the general welfare with striking efficiency. This requires two things. Well-laid plans of technical work must be carried out over long periods to their fulfilment. A strong staff of trained experts, the best to be had, must be retained under assured conditions of employment. These two things can be accomplished only through continued Federal ownership of the National Forests.

It is now proposed to transfer the National Forests to the States. Even assuming that the States will retain the Forests intact and not break them up and parcel them out as most advocates of State ownership desire, 20 different State governments can not give the Forests the kind of administration necessary to meet these conditions. To replace the present central administration with 20 widely-scattered local administrations would inevitably disrupt and bring to naught much of the technical work already laid out and begun. Instead of one consistent policy of development along the lines which I have briefly indicated, we would have 20 policies of every variety from good to bad, depending upon the local point of view and the extent to which the local handling of the Forests is influenced by politics and by business interests eager for a different kind of exploitation. It is inevitable that under such conditions the present aims of administration would be abandoned in many States and that instead of working for stable development and permanent usefulness, the Forests would be exploited for all that they could produce in a few years without scientific management for the future.

Furthermore, even in the individual State the stability in policies and aims of administration which is essential for the technical work and trained personnel on the Forests can not be secured as it can under the National Government. Changes in State governments and State policies are more frequent and more radical than in National affairs. The consent of fewer people needs to be obtained. Public responsibilities are less broad and subject to less severe scrutiny. Political and corporate influences have greater weight. There are, of course, individual exceptions to such a broad statement. But it is certain that the people of the United States can not look to 20 different State governments to handle these public resources in the aggregate with such stability and continuity of policy as the National Government has displayed in the past and can be counted upon to exhibit in the future.

The Staes are unable to administer the Forests with a view to the greatest possible permanent returns and without pressure for immediate profits as can the Nation. They can not invest the funds now needed for scientific study and development of these resources with the freedom possible for the Federal Government. Scarcely one of the western States could now assume the financial burden of administering and protecting the Forests within its borders with the same care and forethought with which they are now administered by the Nation. The first sacrifice in expenditures would be in those for technical and scientific work. With this curtailment would be sacrificed much of the latent future value of the resources in the Forests. The States would be unable to correlate the work done in different sections and to apply the results gained in one region to the conditions in another region, as is possible under central control.

The successful development and use of these public resources are largely wrapped up in the technical work done on the National Forests and in the kind of trained men who are secured to do it. To safeguard these vital factors in accomplishing what the National Forests have been created to accomplish, the people of the United States must continue to look to the Federal Government.

GRADED ASSESSMENT OF REFORESTED LANDS

By Arthur Goadby

FOREST taxation theories at present seem to trend toward a policy of levying an annual tax on the land assessed at its value exclusive of stand, supplemented by a harvest tax estimated on the stumpage value.

Now, while this is undoubtedly the true basis of a scientific forest tax system and will be most valuable in conserving existing forests, I feel convinced that when strictly applied it will tend to discourage that extensive and intensive reforestation now become so essential to the welfare of our country.

However just it might be economically that forest lands should be taxed at varying amounts although equally productive of gross revenue, it would be nevertheless most unfortunate in other respects, for it would tend to discourage a widely diffused forestation and banish the forests to the mountains and the barrens, notwithstanding the fact that they are needed in agricultural communities, for they prevent erosion, break the force of winds, temper the climate and beautify the land. In Europe, especially in Germany and Austria, they are found not only in farming districts but also in the environs of some of the largest cities and towns, and it seems to me that a far-sighted statesmanship at home would emulate those conditions.

Moreover, a strict application of the above method would tend, I believe, to discourage intensive culture as well, because such culture is usually applied to fairly valuable lands, the taxes on which, together with the insurance, interest and maintenance charges and the delay of income, constitute a series of disadvantages which the owner of natural woodlands would escape but which planters must face notwithstanding the benefits they confer upon the community. It seems to me only wise and just, therefore, that some modification should be devised whereby these disparities might at least in part be overcome.

The most effective way, perhaps, would be a compromise wherein the different interests involved would make small sacrifices and reap corresponding benefits later, the towns mitigating assessments in proportion to the amount of capital invested in the planting and in consideration of the many local benefits conferred by standard forests, which benefits sooner or later neighbors should learn to appreciate; and the planter receiving a release of taxes in approximate proportion to the increase of his interest charges; and the state undertaking supervision and protection from fire and insect-blight in consideration of a prospective increase in taxable wealth. Perhaps the modification suggested below might accomplish this result.

First let the state enact that all growing timber shall be exempt until harvest and then shall pay a tax of two per cent on the stumpage value; and that all private land shall be assessed at a value reckoned without reference to any immature timber thereon; and that all wooded land shall be assessed at its value if denuded, which value shall be gauged by the assessed value of denuded lands of similar quality and location in the same tax district, and the taxes be annually collected therefrom; except that—

In the event that any landowner shall agree with the state as to quality and maintenance, etc., he shall be entitled to certain releases on the assessed value of his land as follows:

(1) Every acre in area of not less than five acres shall be assessed as follows: (a) If its assessed value when denuded is not greater than twice the average value of farm land in the state

(as such average is determined by the last census or state tax commission), said acre shall be assessed 10% less for every one hundred standard trees planted or sub-planted thereon at intervals of not less than six feet; (b) if between twice and four times that average it shall be assessed 8% less for every such hundred trees; if between four and six times that average it shall be assessed 6% less, etc.; and

(2) In consideration of every such 10, or 8, or 6% release there shall be levied at harvest an extra tax of one-half of one per cent over and above the regular harvest tax of two per cent.

The inverse assessment ratios suggested above are designed to prevent evasion of taxes for speculative purposes.

As an illustration of the technique of this inverse ratio assessment scale, let us assume that the average value of agricultural land in any state is officially declared to be $20 per acre (*e. g. vide* New York, Census 1910); therefore land normally assessed $30 an acre sub-planted with five hundred trees would be annually assessed and taxed on a valuation of $15 and would pay a harvest tax of 4½%. Land normally assessed $120 planted with 1,000 trees would be assessed as $48 and would pay a harvest tax of 7%. Land normally $190 would be $152 and be taxed at harvest 7% if planted with 1,000 trees. A penalty equal to the accumulated releases should attach to the owner who cleared his land before maturity unless legally excused.

FIRST APPALACHIAN TIMBER SALE

THE United States has made its first timber sale on the newly purchased Appalachian Forests, and the voucher that established the fact has been an object of interest in the hands of the officials of the Department of Agriculture who have had occasion to handle it. The voucher itself does not show what the character of the sale was, but inquiry has drawn forth the information that the material disposed of was $7 worth of logs, bought by a Georgia farmer to use in building a barn. This apparently insignificant transaction is regarded as a foretaste of the future when the Government will be taking in a tidy revenue from the forest lands which it is now buying in the East.

These lands are being bought primarily to protect navigation. Congress held, in providing for their purchase, that the Constitution prohibits the Government from buying lands for these eastern forests except at the headwaters of navigable rivers, and for the purpose of regulating streamflow and preventing the silting up of the channels of commerce. Yet the production of timber will also be made one of the objects of applied forestry as the Government will practice it on these areas. The latest purchase, made last February, was of 75,000 acres in North and South Carolina and Georgia, on the headwaters of the Savannah River, and brought up the total which has been bought to 400,000 acres. Of this, 320,000 acres are in the Southern Appalachians and 80,000 in the White Mountains.

Not all of the land is well timbered now, for the Government in many cases cannot afford to pay the value of land and heavy timber together. Consequently most of the land acquired has been culled or cut over or else is sold to the Government with the reservation by the owner of the right to cut and remove the timber under methods prescribed by the Forest Service. Nevertheless, sales of material will doubtless be made from time to time, and will increase in number and value as improved forests grow up on these areas, under the stimulus of proper forest management and protection from fire.

TIMBER SALES IN CALIFORNIA

TIMBER sale operations on the National Forests in California have been increasing at a rapid rate during the past few months and a number of important sales have been made. The largest of these was an 800,000,000-foot sale to the Sierra Sugar Pine Company on the Sierra National Forest. About seventy miles of railroad will be required in connection with this sale and two years are allowed in the contract for preliminary construction work before operations actually begin. The contract covers a cutting period of twenty years. This sale is in one of the best sugar and yellow pine regions of the State. Another sale of considerable size was made to the M. A. Burns Lumber Company on the Shasta Forest, for a total of 182,273,000 feet.

Timber operators are showing considerable interest in National Forest timber and, judging from the number of inquiries received, the present indications are that quite a number of sales will be consummated in the near future. In anticipation of this increased activity in timber sales, it is planned to place several crews of estimators in the field this spring, and the work will be carried on on a larger scale than in any previous season. It is planned to cover the following areas before the work closes down next fall:

California National Forest, 75,000 acres; Sierra National Forest, 80,000 acres; Klamath National Forest, 100,000 acres; Plumas National Forest, 70,000 acres; Lassen National Forest, 60,000 acres; Trinity National Forest, 75,000 acres; Sequoia National Forest, 75,000 acres; Tahoe National Forest, 50,000 acres.

The above, with the areas already cruised, places the Forest Service in a position to offer lumbermen almost any size or kind of logging proposition that could be desired. The estimating on the California and Sierra Forests is considered of first importance since several tentative applications have already been received for the timber on the California, and it is expected that the area on the Sierra will be opened up this year by a proposed extension of the Santa Fe Railroad.

Especial care has been taken to select men of training and experience to take charge of the crews, and they convened for a two weeks' school of instruction on the Plumas Forest in March. The purpose of the school was to try out the accuracy of the various methods which have been used in the past and to standardize the work for the District. Sample areas were laid out and estimated by the different methods and comparisons were made of the accuracy and time consumed.

NATIONAL FOREST TIMBER FOR SALE

THE Forest Service has just begun to advertise the twelfth large lot of National Forest timber offered for sale within the past nine months. Altogether, it has advertised since July 1, 1912, the beginning of the present fiscal year, about 2,500,000,000 feet, and has closed contracts for the sale of 1,700,000,000 feet. The latest advertised sale is of approximately 52,000,000 feet of saw timber in the Rainier National Forest, about 35 miles from Tacoma.

In offering National Forest timber for sale the Government first makes an estimate of the quantity of timber on an area which would naturally form a single logging unit, and which offers attractive opportunities for the lumberman. The probable cost of logging and manufacturing by a capable lumberman is then estimated. On the basis of these

estimates combined with the figures for market values and freight charges, the timber is appraised and then advertised for sale, with the appraised value as a minimum price.

The minimum prices set for the Rainier timber vary from 50 cents to $1.50 per thousand feet, according to the kind of timber. These are stumpage prices—that is, the purchaser buys the trees on the stump and does all the logging, but pays according to the board foot measure of the logs. The Government aims to allow the manufacturer a liberal profit on the basis that lumbering involves a good deal of business risk, and the minimum stumpage prices are fixed accordingly. Often, however, competitive bids raise the price above the advertised minimum.

One of the provisions of the contract which the successful bidder for the Rainier timber will enter into will be that if market prices advance materially the Government's Chief Forester may, after the sale has run three years, require a reasonable readjustment of the stumpage prices up to an added 50 cents per thousand. The object of this stipulation is to prevent loss to the Government—that is, to the public—and an undue profit to the purchaser through long-term contracts entered into on a rising market. Provision against such speculative profits is regarded as especially necessary in view of the long-term sales now sometimes made to get purchasers for large bodies of inaccessible timber.

For the Rainier sale the cutting period allowed is only five years, since the quantity of timber involved—approximately, 52,000,000 board feet—does not call for an extended operation. One National Forest sale made this year was for 800,000,000 board feet and the purchasers were allowed a cutting period of twenty-two years besides a preliminary two years in which to build a railroad. Usually purchasers must begin operating the year of purchase and cut a stipulated amount each year. The latter provision is simply an example of a fundamental principle that is applied in all National Forest timber sales. The primary object is described as being not profit for the Government but benefit to the public. Nowhere is the policy a strictly commercial one. The conditions of cutting are carefully prescribed from the standpoint of present as well as future needs. The highest bid for the contract may be rejected, and is rejected if it appears that to give the bidder the contract would tend to facilitate timber monopoly, and so subject the consumer to a hardship. In other words, the Government foresters consider that they should not only make the forests grow as fast as possible but also make them as useful as possible to the public.

INTERNATIONAL FOREST CONGRESS

IN conjunction with excursions to some of the more important French forests, the Touring Club of France, under whose auspices the coming International Forest Congress will be held in Paris June 16 to 20, has provided a program of reports covering a wide range of forest subjects. These reports, which should be of interest alike both to technical foresters and private owners of woodlands, are to be given by well-known French forest officials and are included under five general sections as follows:

FOREST OR SILVICULTURAL TECHNIQUE.

Silvicultural Instruction. — Encouragement of and returns from silviculture. Instruction in forestry and rural economy. Propaganda in favor of forests and streams. Student forest associations.—Arbor days.

Prolongation of rotation periods in coppice and coppice with standards.—Diminution of the proportion of wood in small dimensions.—Conversion of coppice and coppice with standards into high-forest.—Improvement in coppice stands of light yield situated in the

plains or on mountains, by the introduction of conifers.

Acacia coppice forests.—The walnut.—The chestnut.—Methods of remedying their disappearance and necessity of renewing and extending their culture. Exotic and native species. Distribution of forests and shrubs in France.

FOREST ECONOMY AND LEGISLATION.

Comparison of forest legislation.—Rôle of the State in forestry.—Comparison between the different countries.

Forest Taxes. Insurance against forest fires. Establishing protection forests. Intervention of the State in the management of private forests.—Different forms of legislation regulating this intervention.

Acquisition by the State, communities, or public corporations or associations for public welfare, of forests or lands to be afforested.—Legislative, administrative, and financial methods to be undertaken for facilitating such acquisition. Leagues.—Syndicates.—Forest credit funds.

Utility of an international forest office founded by the syndicate of forest owners (stations for research, experiment, and instruction). Forest production in the different countries of the world. Importation and exportation. Custom-house duties. Transportation of wood.

FOREST TECHNOLOGY.

Wood Commerce and Industries.—Exploitation of forests. Forest implements. Plantation of routes. Industrial subsidies. Wood utilization.—Rough woods, fuel, charcoal.—Mine props, telegraph poles.

Wood preservation.—Natural methods; artificial methods (glazing, injection, immersion, ignition). Squared timber.—Beams, frames, girders. Different uses of wood.—Paper manufacture, wood wool, wooden shoes, hoops, curved wood, veneering, and artificially tinted wood. Sawed timber.—Implements, waste, carpentry, pavement. Accessory products.—Refuse wood. Utilization of sawdust. Split wood.—Shingles, stave or cooper's wood, bark (tannin extracts, cork).

Carbonization of wood.—Tapping, processes, species, extraction of tar, wood distillation, bark. Wood utilized in the match industry and manufacture of boxes. Utilization of minor forest products by the new chemical and mechanical processes.

IMPORTANT FOREST PROBLEMS.

Pasture improvements.—Creation, restoration, and maintenance of grazing tracts. Management and regulation of pastures belonging to associations or communities. Wood cutting privileges. Outside flocks. Goats, sheep. Lofts or chalets. Shelters, preserves. Irrigation and drainage ditches. Timber windbreaks. Roads. Transportation cables. Waste lands, plains, plateaus, and coast lands (heaths, swamps, moors). Their transformation into pasture land; their afforestation. Mountain tracts, conservation and improvement of wooded tracts.

Moors, swamp lands.—Their drainage and improvement by afforestation. Species to be used. Methods of planting.

Dunes.—Fixation, afforestation, and defense against the ocean. Means of action furnished by existing legislation. Legislative measures to be undertaken.

Important works.—Barriers, connections, canals, tunnels. Restoration of mountains. Combatting avalanches and torrents.

Minor works.—Fascinage, wattlework, road-beds, gravel, drainage, grassing, reboisement (sowing and plantations, species). Species to be used, seed, nurseries.

Relation of tree and stream.—The struggle against inundations.

THE FOREST IN RELATION TO THE DEVELOPMENT OF TOURING AND THE ESTHETIC EDUCATION OF THE PUBLIC.

Forest education of the public.

Protection of the Scenery in France: Forest scenery.

Beauty of streams (the tree on the mountain is the water in the river).

Beautifying the highways.—Plantations along routes, their advantages, choice of species.

Scenic beauty.—Measures undertaken

by different countries for its protection. New measures to be undertaken.

National parks.—Reserves and artistic plans.

Alpine gardens, arboretums.

Management of forests from a touring point of view.—Creation and improvement of highways. Forest paths.

Placards, beams, guide boards, shelter, benches, views, guide tables, etc. Guide books, forest maps for the use of tourists. Catalogues of remarkable trees.

CANADIAN FORESTRY MEETING

ARRANGEMENTS are now well under way for the Canadian Forestry Convention to be held in Winnipeg on the opening days of the Winnipeg Exhibition, July 7, 8 and 9. This convention is being held in Manitoba upon the invitation of the Government and civic authorities, and promises to be one of the most interesting conventions yet held. The subjects taken up will have particular reference to prairie conditions. A leading place will be given to the subject of tree planting on the prairies for the purposes of beautification, wind breaks, fuel, fence posts, etc. The whole matter of the value of forest reserves in the prairies and how they should be handled in order to produce the best results will have a large amount of attention devoted to it. The relation of forests on the headwaters of streams running through the prairies is a most vital one to the agricultural community and will receive adequate attention. Besides this the protection and development of Canadian forests both East and West will be dealt with, because upon the proper handling of these areas depends the price of forest production to all dwellers on the prairie. It is expected that practically all the Governments in Canada having to do with forests will be represented, and a number of leading men in different lines of work, lumbering, business, banking, farming, forestry, etc., have promised to take part.

Every year sees the importance of forestry increase in Canada, and when it is realized that the comparatively small prairie forest reserves if properly handled will produce in perpetuity more good timber than some of the forest provinces are now cutting, will show the possibilities that lie in this direction. The question of fire protection, the leading one as yet in Canada, and in which great strides have been made in the last three years, is bound to be fully discussed and the possibilities of reforestation will be given due place.

For programs and information as to railway rates to delegates, etc., application may be made to James Lawler, Secretary, Canadian Forestry Association, Canadian Building, Ottawa, Canada.

STUDYING PAPER WOODS OF NEW YORK STATE.

The State College of Forestry at Syracuse has just sent out to the Presidents and Secretaries of paper manufacturing companies throughout New York a form letter which explains the need of a more thorough understanding of the paper woods of New York State from the Forester's standpoint. Outlines of plans for a field study which has already been begun are described. Suggestions are asked from the paper manufacturers as to the way in which the problems in which they are most vitally interested may be taken up most effectively by the college. Mr. Reuben P. Prichard, a graduate of Dartmouth College and of the Yale Forest School, who has had some years of practical experience with the Government Service through the Western States, and who is now an instructor in Forestry in the State Ranger School at Wanakena, is making the field studies in this investigation.

EDITORIAL

SEPARATE FORESTRY DEPARTMENTS NECESSARY

A RECENT and growing tendency in state forestry is the attempt to consolidate the forestry work with other departments, chiefly fish and game, lands and water powers. The conservation movement has given impetus to this idea, which has found a ready response from politicians who see an opportunity for paid commissions, high salaries and numerous places for their spoilsmen.

So far as they have been tried, such combinations have uniformly retarded and injured the cause of forestry in the States. Under the Conservation Commission, New York's model fire protective force fell a prey to Tammany politicians. Michigan's Public Domain Commission has incurred the vigorous condemnation of the Michigan forestry interests who worked hard for its establishment. Louisiana, under a conservation commission combining fish and game with forestry and minerals, has neglected to employ foresters or do anything definite to advance forestry in the State.

In the States in which active progress is being made, this advance is in every instance due to the organization of forestry work as a separate department, under a non-political board, and by employing trained foresters to do the work. But as this work increases in importance, fresh efforts are made by politicians to get control of the non-partisan machinery, and appropriations which non-partisan efficiency has been instrumental in securing. Within the last month the Minnesota legislature has proposed the establishment of a Public Domain Commission modelled after the body which Michigan foresters have rejected,—and in New Hampshire, the governor has made a strenuous effort to bring the fire-warden force under political contract and abolish the office of State forester.

Foresters and forestry associations should clearly realize that consolidation means great danger, and probable ruin for forestry. No European country would consider such combination of forestry with other functions of State-wide interest. The only feasible combination is that exercised by foresters in charge of definite areas of land which they protect from fire, and administer for all useful purposes.

It is hoped that further efforts to obscure and sidetrack forestry by combinations and by destroying the hard-earned immunity from politics and spoils, will meet with vigorous and united opposition on the part of all who desire real progress in forest conservation.

MR. ASTOR'S INTEREST IN AGRICULTURE.

Mr. Vincent Astor, the richest young man in America, has decided to devote much of his attention to scientific agriculture, including the proper development of woodland, on a farm of some 6,000 acres on the Hudson River at Rhinecliff. He has been appointed by Governor Sulzer, of New York, as chairman of New York's delegation to the general assembly of the International Institute of Agriculture, which will be held in Rome, Italy, next May. He may also attend the International Forestry Congress in Paris in June. Mr. Astor is a member of the American Forestry Association.

STATE NEWS

Minnesota

"With four feet of snow in the Northeastern section, high floods in the Red River valley and forest fires in the central part of the State, Minnesota shows a diversity of climate that bespeaks a vast expanse of territory," remarked W. T. Cox, State Forester, the other day after reading reports from his forest rangers. "I have reports showing that the roads in the Northeast still are impassable except on snowshoes or skis, as the snow lies four feet on the level. Over in the other corner of the State the Red River is out of its banks.

"On top of these extreme conditions I have reports from Ranger J. P. Saunders, whose headquarters are at Brainerd, of the campaign against two forest fires to the West of Brainerd. One swept a territory of 2,230 acres of young pine before it was arrested and the other 370 acres. The commercial loss is small but forest men regard such visitations as a serious economic waste. The pine was from four to ten years old."

Pennsylvania

During the last four years the Venango Oil and Land Company has been conducting near Oil City, Pa., some very interesting experiments in reforestation, which are the first attempts along this line in Venango, or any of the surrounding counties. The company owns a large tract of land just North of Reno, and has devoted 200 acres to this end. On these are planted 200,000 young trees in lots of about 1,000 to the acre. These young trees, mostly white pine, oak and some poplar and hickory, are now about a foot high. This spring 45,000 more trees will be added to the number. All these, with the exception of the first year's planting, were raised from the seed. The work was planned for the company by Government foresters. According to them it will be 60 years before any marketable timber can be taken from the young forest.

New York

The State College of Forestry at Syracuse has been conducting in co-operation with the United States Forest Service a careful study of the wood-working industries of New York. In connection with the study of the woods used in our industries, their sources and methods of more complete utilization, the experts of the college have been reporting on forest conditions in counties throughout the State.

Reports sent to the State College of Forestry by its field men show that the figures given out by the last census for New York, while fairly correct, are not commonly understood or appreciated. The census reports show that out of the 34 millions of acres in the State but 22 millions are enclosed within farms. This leaves an area of 12 million acres partly in forests and partly as idle land. This vast area is equal to all of Rhode Island, Connecticut and Massachusetts and 40 miles North in Vermont and New Hampshire or all of New York North of the New York Central Railroad.

The census reports show further that of the 22 millions of acres enclosed within farms but 15 million are actually in agricultural crops. This means that there is an area the size of Massachusetts enclosed within the farms of the State operated without profit. The farmers of the State are losing a very large sum of money by not getting a reasonable income from this great area. Lands in Germany and Austria not as well adapted to the growth of forests as the idle lands within our farms are producing as high as $2.50 to $5 per acre per year, or two and one-half to three per cent compound interest. This same income can be gotten from idle lands in New York.

Assemblyman John G. Jones, of Carthage, has introduced a bill amending the conservation law by providing that unimproved and nonagricultural private lands upon any of the watersheds of the State and within State parks upon which the forestry growth has been destroyed, shall be reforested by the owners. If they fail to do so after receiving notice, the conservation commission will have the power to do the work and charge the cost against the owners of the land at four per cent interest to be paid after the trees have been cut and before their removal. Where payment is not made, the lands may be seized and sold. The bill is supplementary to the one recently introduced by Assemblyman Jones, calling for an appropriation to be used in purchasing mountain tops and slopes to prevent erosion and the destruction of forests, that the State forests may not only be perpetuated, but that a natural water storage may also be created and the flow of the power streams be made more uniform the year around.

Maine

Prof. John M. Briscoe, of the University of Maine Forest School, reports that the legislature has increased the school's appropriation by $1,000, and also that the school has received $2,000 for establishing a State forest nursery in the next two years. In the fall the school will engage an assistant to

Prof. Briscoe, who has made a great success of his work and the whole curriculum will be revised and brought thoroughly up to date.

Pennsylvania

Pennsylvania school children are preparing for a war of extermination on the tussock moth. Superintendent of Schools Brumbaugh in his letter to school principals urging them to interest the children in the fight says:

"Last September the adult moth laid the eggs upon the old cocoon and covered them with a white frothy substance. This makes them easy to recognize.

"Now is the time to catch the enemy sleeping. Remove by hand all the egg masses within reach, those higher up may be scraped off with a sharp-pointed hoe, or from a stepladder. Search carefully the crevices of the bark upon all the trees, along fences, under window sills, cellar windows, porches, all nooks, crevices and sheltered places. Make this search very thorough, for one egg mass overlooked will later hatch out hundreds of caterpillars.

"The egg masses may be collected in paper bags, which then should be thrown into a fire and so burned without danger of scattering. If the cases of the bag worm are present, they, too, should be collected and burned. They are about an inch long and will be found hanging from the twigs of the trees.

"As a preventive measure, every tree should be banded with a strip of tanglefoot five inches wide, five feet above the ground. One pound of tanglefoot will paint a strip eight feet long and five inches wide. It is suggested that all classes be given an opportunity to do some part of this work on the school property and that each child be encouraged to carry the crusade into his own community."

North Carolina

The regular biennial session of the State Legislature came to an end on March 12th, having done very little for the cause of forest protection in this State. The most important measure introduced was a bill to provide a system of forest wardens in the townships in which the amount of woodland and the danger from fire warranted it, and providing an appropriation of $5,000 to carry it into effect. After consideration and much delay, this bill was killed in committee. A second bill providing only for co-operation in fire protection with the U. S. Department of Agriculture or with the various counties of the State, met a similar fate.

A measure of almost equal importance with the Forest Warden Bill, was the State Wide Stock Law Bill. This would prevent live stock ranging at large over other people's property, as they still do in many counties of this State. This measure met with very bitter opposition and was finally defeated in spite of a very strong showing in its favor.

A bill to establish an Arbor Day in North Carolina was passed by the Lower House and received a favorable report from the Senate Committee by which it was considered, but in the rush at the end of the session it was killed, more from lack of time to consider it than from any definite opposition to the measure.

Only two laws were enacted that had any bearing on forest protection, and these, it is feared, lack machinery to make them as effective as they should be.

The first one amends our present law which forbids "any wagoner or other person encamping in the open air" leaving his camp without totally extinguishing the camp fires, by adding "or hunter who shall set fire to any tree, stump, or other combustible matter and leave without totally extinguishing such fire."

The second is entitled "an act to protect watersheds owned by cities and towns from damages by fire." It provides "that any person, firm or corporation owning lands, or the standing timber on lands within four hundred feet of any watershed held or owned by any city or town, for the purpose of furnishing a city of town water supply, upon cutting or removing the timber, or permitting same cut or removed, from lands so within said four hundred feet of said watershed, or any part thereof, shall, within three months after cutting, or earlier upon written notice by said city or town, remove or cause to be burned under proper supervision, all tree-tops, boughs, laps and other portions of timber not desired to be taken for commercial or other purposes, within four hundred feet of the boundary line of such part of said watershed as is held or owned by such town or city, so as to leave such space of four hundred feet immediately adjoining the boundary lines of such watershed so held or owned, free and clear of all such tree-tops, laps, boughs and other inflammable material caused by or left from cutting such standing timber, so as to prevent the spread of fire from such cutover area and the consequent damage to such watershed." Any violation of the provisions of this act is made a misdemeanor.

This law clearly recognizes the duty of the State to require owners to so regulate their woodland operations as not to interfere with the rights or the privileges of other citizens of the State. It is a step in the right direction and indicates the trend of public opinion.

Kentucky

The State Board of Forestry has under consideration at the present time two sites for State nurseries which it hopes to get started this spring. By co-operative agreement between the trustees of the Kentucky Normal and Industrial Institute and the State Board of Forestry, sixty acres of land near Frankfort, Kentucky, will be turned over to the State Board of Forestry for use as a nursery, transplant beds and demonstration

forests. By a like co-operative agreement, twenty-five acres of land at the State Fair grounds at Louisville will be turned over by the State Board of Agriculture, Labor and Statistics for a nursery, transplant beds and demonstration forest so that it will form a permanent exhibit at the State Fair of forestry practices. In this way it is hoped to bring the forest work in the State to a large range of people. The State Board of Forestry will meet approximately the fifteenth of April to pass upon these two propositions and in addition to consider finally an agreement between the United States Department of Agriculture and the Board for co-operative work under the Weeks Law.

On Tuesday, March 25, State Forester J. E. Barton, addressed on invitation a joint meeting of the Tennessee Legislature at Nashville, Tenn., on forestry legislation then under consideration before that body. John H. Finney, Chairman of the Forestry Committee of the Southern Commercial Congress, also addressed the legislature upon points involved. The lumbermen of Tennessee are making an effort to have the forest work in the State segregated from the office of the Fish, Game and Forest Warden and created a separate department with the State Board of Forestry and the State Forester.

Arrangements are being made for the organization of a Kentucky State Forestry Association at Louisville, Ky., during the first week in May.

Vermont

The indications for an early spring are already stimulating an interest in forest planting, and over fifty orders have been received by the State Nursery for trees. The new law, which provides a fairer way of taxing young growing forests, will undoubtedly be a great factor in reforesting the waste lands of the State. Vermont is the third State to pass such legislation, by means of which the growing timber is not taxed until it is cut. The annual tax is levied on the land alone to be assessed at not over $3 an acre, and there is a ten per cent tax upon the gross stumpage value of the lumber when cut.

The most encouraging feature about the reforestation movement in Vermont is the fact that so many people who have planted in previous years are continuing to do so, indicating that their former efforts have been successful. It is estimated that fully 75% of all the trees planted during the past four years are now alive and well established; while in some stands over 90% are alive. Among the largest planters of past years is Dr. Wm. S. Stevens, who has now planted 115,000 trees on his farm in Enosburg, and is to plant 50,000 more this spring. Another enthusiastic planter is Miss Woodbury, who, during the past three years, has set 25,000 trees in Weathersfield, and is to plant 10,000 white pines this season. T. D. Hobart, of Texas, who spends his vacations on his birthplace in Berlin, has planted there 27,000 white pine and 5,000 Norway spruce. This year he is planting 3,000 of each.

That so many of the large lumber concerns are interested is particularly encouraging. The Newton & Thompson Manufacturing Company, of Brandon, has planted during past years over 20,000 pines and this season is to plant as many more. The Bridgewater Woolen Company, which planted 16,000 trees in 1912, reported in the fall that 95% were alive, and ordered 25,000 for 1913. The Putnam Lumber Company of Middlesex have set out 12,000 trees and are to continue by planting 10,000 this spring. Many other former planters are demonstrating their satisfaction in the work by planting more land.

Among the most interesting undertakings in this line, thus far, is that of the City of Montpelier, in reforesting its watersheds in Berlin. This work, which was begun under Mayor Ballard, is being developed under Mayor Estee. Last year 10,000 white pine and 2,000 Norway spruce were planted. This season the following kinds will be used; 10,000 white pines, 10,000 Norway spruce and 8,000 Scotch pines.

The most interesting new development in forest planting is in Arlington, where Mrs. Flavia Canfield is starting for her little granddaughter a large forest to be a memorial to the late Dr. Canfield. 25,000 white pines are to be planted this year as a beginning, and in succeeding years more trees will be planted until about 200 acres of the old Canfield farm is reforested. The little girl, who is now only three years old, will have, in this forest, a very valuable property as the result of this far-sighted policy on the part of her parents and grandmother.

Among others who are beginning reforestation this year may be mentioned: The Jones Lumber Company, of Warren; Edward H. Williams, of Woodstock; Hon. Charles A. Plumley, of Northfield; Mr. Arthur Palmer, of Thetford, and Master Harold E. Sawyer, a nine-year-old boy in Plymouth, Vermont.

The State Nursery has been steadily enlarged, and it is believed that it will be able to meet all orders this season for the first time.

Massachusetts

The Massachusetts Forestry Association will hold a special meeting at Springfield about the middle of May under the auspices of the Springfield Branch for the purpose of arousing interest in State Forests. Prominent speakers will be present. The people are beginning to demand that some of our waste lands be put under State management as State Forests and a step in that direction will be taken next year.

We now have twenty-one branch associations and over 2,500 members. Some of the branches have done excellent service this spring for their several localities. The New Bedford Branch has raised a public sub-

scription sufficient to plant shade trees on both sides of four miles of streets. The trees will be planted this spring, each will be supplied with a guard and a guarantee for one year. Many power sprayers have been bought and several municipal nurseries established through the influence of the branches.

The entire State will be covered this summer by our field secretaries who are trained foresters, and more branches will be organized. Within the past month we have located one of these men in a permanent position as town forester, and assisted another to procure a temporary position in the same line of work. We expect to continue this system until the whole State is supplied with town foresters which will require about 150 men. These positions will be created by the branches and our field secretaries will be recommended for the positions.

Georgia

Mr. Bonnell H. Stone, an assistant in the forest school, has accepted a position as forester to the Pfister & Vogel Company, which has large holdings in North Georgia. Mr. Stone began his new duties on the 1st of April. His hearquarters are at Blairsville.

Professor Akerman recently examined and reported on a tract in Habersham County, under the State's co-operative agreement.

The forest school will move into Compton Hall by the 1st of May. This building will be occupied exclusively by the forest school. It was secured largely through the influence of Chancellor Barrow, who has taken a deep interest in the forest school.

Michigan

In February, Senator Schafroth, of Colorado, as a guest of the Oratorical Association, made an address in University Hall, at the University of Michigan, Ann Arbor. The audience was largely made up of students and faculty. The Senator chose "Conservation" as his subject, but his statements were classed as inaccurate and unfair, and the students of the Forestry Department urged that immediate answer be made so as to prevent any possible damage which might have been done by the mis-statements in the address, but this could hardly be considered since the Senator was a guest of the University. However, Professor Roth, Dean of the Department of Forestry, soon afterward read an address before the Forestry Club in which the attitude of the Senator was clearly shown. This address was sent out to the members of the Forestry Association and has been widely commented upon throughout the State.

Interest in the subject is undoubtedly growing but the politicians seem to have prevented the consideration of the bills introduced through the efforts of the Association—as far as this session of the Legislature is concerned. The bills are probably the most comprehensive yet drawn and more or less opposition was to be expected. The State Forestry Association will continue to urge their passage in the present and coming sessions.

The Faculty of the Forestry Department of the University of Michigan continues with its work in extension lectures about the State. A portable lantern (which can easily be packed in a suitcase and which operates with compressed gas) has been secured and more and more lectures are being called for. The Grangers are taking great interest in the care of the woodlots and in the planting of forests for protection. Professor Roth addressed the Grange at Hart, Mich., and was urged to investigate and make specific recommendations at once. Oceaniana and Hart counties are heavy fruit-growing belts and have suffered severely at times from frosts and winds. Professor Roth was unable to spare so much time as would have been required for this work, but promptly arranged to detail one of his assistants, Mr. J. H. Pottinger, who visited the region, lectured at many of the school houses to packed audiences, illustrating good and poor practice with the lantern and making suggestions as to improvements in the field. The almost total lack of fire protection adds to the difficulties of the situation. There can be no question, however, but that there is a greatly increased interest and intelligence in the care of woodlots and in forestry in general.

Iowa

The class in lumbering from the forest school at Ames, Iowa, spent a vacation of three weeks in a detailed study of logging and milling methods in the short-leaf pine region of central Arkansas. The students were under the supervision of Assistant Professor Geo. C. Morbeck.

The operations of the Fordyce Lumber Company were studied very intensively, beginning with the standing trees in the forest and through all the various stages of manufacture to the finished lumber loaded in the car. The company cuts shortleaf pine exclusively. The timber in the vicinity of Fordyce is of a mixed type, consisting of 60 to 90% shortleaf pine, the remainder of the stand being mostly oak, gum and hickory. On the lower areas cow oak, red gum, black birch and cypress are the prevailing species. The soil is light, sandy and shallow and particularly adapted to forest growth. Of particular interest to foresters is the fact that land formerly in cultivated plantations, abandoned during the Civil War, has produced stands of merchantable lumber in 50 years without the least care.

The Fordyce Lumber Company recently purchased 800 acres of timber estimated to cut 8 to 10 thousand feet B. M. per acre, on land which in war days was growing cotton and corn.

Other operations, chiefly mills cutting hardwood lumber, staves, wagon and automobile stock, were also studied on the trip.

Oregon

The Oregon legislature recently enacted what is probably one of the most advanced forest protection laws found on the statutes of any State in the Union. It provides that "Every owner of timber land in the State of Oregon not residing within one and one-half miles of said land shall furnish or provide a sufficient fire patrol therefor during the season of the year when there is danger of forest fires, which patrol shall meet with the approval of the State Board of Forestry. In case any owner or owners shall fail or neglect to provide such patrol, then the State forester, under direction from the State Board of Forestry, shall provide the same at a cost not to exceed five (5) cents per acre per annum. Any amounts so paid or contracted to be paid by the State forester shall be a lien upon the property, and shall be reported by the State forester to the county court of the county in which such lands are situated, and shall by such court be levied and collected with the next taxes on such lands in the same manner as taxes are collected." The county court shall repay the money so collected to the State forester, to be applied to the expenses incurred in providing the necessary patrol. The State forester does not think it advisable to provide actual patrol for privately owned timberland, except as a last resort, and the law will therefore be used to persuade heretofore indifferent owners to join fire patrol associations in counties covered by such organizations, and to stimulate the formation of associations in counties where none exist now. Beyond question, this law will prove a powerful factor in advancing systematic Statewide forest fire protection. It has the unqualified approval and support of the progressive timberland owners of the State.

Legislation was also enacted which will permit the State to exchange its scattered school lands located within the national forests for a compact body of timberland. For the purpose of establishing a State forest, the lands selected shall be withdrawn from sale for a period of fifty years. While the administration of the State forest is under the jurisdiction of the Board of Forestry, the forestry department of the Agricultural College is accorded privileges for field and demonstration work.

EDUCATIONAL

University of Missouri

Practical men engaged in the lumber business, timber land owners, farmers, and all other men interested in forestry will have an opportunity, if they wish, to join a summer camp which the Missouri College of Agriculture will locate next summer on the university forest in Butler County, Missouri. The exact date of the opening of the camp has not been fixed, but it will probably be about June 12th.

The work will include a detailed study of the larger logging operations, and saw mills near Popular Bluff; methods of felling, skidding, loading, transporting, manufacturing and grading lumber; estimating the contents, rate of growth and future yields of individual trees and entire forests; methods of dealing with fires, fungi, and insects; methods of forest surveying, of laying out logging railroads, wagon roads, trails, and of cutting timber so as to secure a continuous timber supply.

The University owns over 8,000 acres of forest land in Butler County and nearly 1,000 in Wayne County. All of this land can be easily reached from the camp.

Massachusetts Agricultural College

A bulletin has been issued by the Extension Service of the Massachusetts Agricultural College descriptive of the sixth annual Summer School of Agriculture and Country Life, July 1-29. Extended courses will be offered for the benefit of the many people who wish a general knowledge of theoretical and practical agriculture and who can come to the college conveniently during the summer season. Special attention will also be given to the needs of teachers.

The courses to be offered this summer will include practical agriculture and horticulture, elementary sciences, agricultural education, agricultural economics, domestic economy and household science, organized play and recreation, and a group of courses arranged especially for rural social workers.

A feature of the Summer School will be the courses on organized play, recreation, festivals and pageantry. William Chauncy Langdon, President of the American Pageant Association, and Master of the Pageants of Thetford, St. Johnsbury, and Meriden, will lecture on pageantry and will also conduct round table discussions on practical details of the subject. Demonstrations of organized play and folk dancing will be given during the late afternoon and early evening periods.

Another forward step taken by the Extension Service is shown in the announcement of a summer camp for boys, the purposes of which are to interest boys in agriculture and rural life, to impress on the boy his responsibility as a member of society and to teach him clean wholesome sports and recreation. The camp will be under military

discipline. During the morning instruction will be given in agriculture, hygiene, and citizenship. Afternoons will be given over to organized play, recreation, games, tramps through the hills, and evening camp fires, all managed by experts.

The usual Conference for Rural Community Leaders will follow the Summer School,—July 29,-August 2. At this conference definite instruction will be given in the morning with special and general conferences in the afternoon, followed by demonstrations of organized play and folk dancing. The evenings will be given over to music and lectures on rural sociology, economics, and education.

Amherst is acknowledged to be one of the most delightful towns in New England, noted both for its natural scenic beauties and because it is an educational center. Expenses are very low. Write for bulletin to Professor W. D. Hurd, Amherst, Mass.

Colorado School of Forestry

A visit to the lumbering districts of Arkansas is the annual spring trip of the senior class of the Colorado College Forestry School this year, and plans have been completed for an extensive investigation of methods in lumbering and mill work in that region. Headquarters have been established at Crosset, in the southeastern part of the State, where the Yale Forestry School visited last year. This is the heart of the lumbering region. The class is accompanied by Professor Terry.

It was planned to spend at least a week at the large mills in the town. The studies there will consist of mill tallying; obtaining accurate figures as to the cost of every operation from the time logs arrive at the mill until the finished product is turned out; mapping the mill yard to show best possible arrangements of the main mill and all buildings in connection which consist of planing mill, lath and shingle mill, kiln drying house and slash burner; and an enlarged plan of the mill showing arrangement of machinery.

Then the students will pitch tents at the scene of the logging operations where they will be able to see the process of felling, bucking, skidding, road construction and railroad logging of the most improved type. Growth studies will be made of both hardwoods and conifers and volume tables constructed.

Finally a complete survey is to be made of as much of the tract as possible. Topographic as well as type maps will be constructed and complete data taken for a working plan of the region.

Pennsylvania State College

The first spring camp of the Pennsylvania State College for Senior Forester is established in West Virginia. This is according to the new forestry course laid out to afford two months' extra field experience in the second half of the Senior year.

The camp is located on the holdings of the Cherry River Boom and Lumber Company, and in the very heart of the logging districts. It is about 25 miles from Richwood—the center of the saw-mill business—on a small creek—Dogway—which runs into the Cranberry River.

The C. R. B. & L. Company operate three large mills near here—two hardwood and one spruce and hemlock—the latter cutting from 340 to 360 M ft B. M. per day equipped with two bands and a resaw.

The company may well be proud of their mills and surroundings and particularly so of the well-kept-up power plant. For several years they have employed, as consulting forester, Mr. Weber, of Munson and Whitaker, and they deserve much credit for the advance taken for conservative lumbering and forestry.

Much is done in the way of fire protection on the company's holdings. Rangers are employed for this special purpose and all engines are equipped with hose for putting out fires, and a fifty-foot right of way is cleared along the main logging roads. Every camp along the line is equipped with a telephone.

Permanent sample plots are maintained on second growth spruce, and experimental planting has been carried on.

A part of the work to be done by the Penn State Foresters will be assisting in planting 60 acres of seed spots. The main part of the work is to consist of constructing a forest working plan for about 1,200 acres of both cut and uncut territory for conservative forest management. This tract to be studied contains pine, spruce, mixed spruce and hemlock, spruce and hardwoods, mixed hardwoods and cut-over lands.

The boys are living in tents even though there is quite a little snow every now and then—and seem to enjoy it.

Mr. R. R. Chaffee, instructor in lumbering and management, is in charge of the camp.

Biltmore Forest School

Students of the Biltmore Forest School returned on April 1 to the United States after a winter spent in the German forests.

During the last winter spent in the German woods the school laid stress, in the classrooms and in the forests, on the study of silviculture and on the study of governmental and municipal forestry. The students became acquainted with the importation of American lumber up the Rhine, with the furniture factories, saw mills, impregnation plants, pulpmills, cooperage plants, woodpaving plants, and also with the forest transportation problems of the old country.

Returning to the United States, the Biltmore students proceeded to Tupper Lake, in the heart of the Adirondacks. Here were studied and visited the river drives of the Santa Clara Lumber Company (on lands

where conservative forestry has been practiced for 25 years, the owners actually not knowing that they were practicing it), the famous State forest nurseries of the Empire State and the State forest plantations near Lake Clear, the former Cornell School Forest at Axton, on Saranac Lake (known for Dr. Fernow's activity), the Webb Estate at Nehasane (where Pinchot and Graves, as early as 1895, were engaged in conservative logging), the operations of the Emporium Forestry Company and of the Brooklyn Cooperage Company, the fibre, pulp and paper mills of the International Paper Company, and so on.

En route from the Adirondacks to North Carolina, summer quarters of the Biltmore Forest School, the students spent a full week in Washington, at the center of all scientific activity in American forestry, and came in contact with the leading men in American forestry connected notably with the National Forest Service, the Bureau of Plant Industry, and the Bureau of Entomology. The students were most cordially received by the Chief Forester, H. S. Graves, and his assistant, A. F. Potter. Special lectures were offered by Raphael Zon on silviculture; S. T. Dana on organization of forest investigative work; F. L. Harvey on legal and illegal claims in the National Forests; Barrington Moore on intensive reconnaissance; Wm. L. Hall on purchase of land in the Appalachians; Dr. A. D. Hopkins on forest entomology; R. Kent Beattie on the chestnut blight; Dr. Perley Spaulding on the blister rust and national legislation prompted by it; W. C. Barnes on grazing problems in the National Forests; O. T. Swan on problems in wood utilization; J. G. Peters on the forest activity of the States; Fred. G. Plummer on graphic methods of surveying and mapping; Austin Carey on lumbering and education of lumbermen.

The students left Washington by boat on April 20 en route for New Berne, N. C., where it is encamped, as usual, for two weeks on the holdings of the John L. Roper Lumber Company, engaged in the study of Southern lumber and lumbering, of the naval stores industry, of the second growth of pine, of the cypress swamps, etc. The school will reach Biltmore in early May.

CURRENT LITERATURE

(Books and periodicals indexed in the Library of the United States Forest Service.)

Forestry as a Whole

Manuals of forestry

Lorey, Karl Julius Tuisko. Handbuch der forstwissenschaft. 3d ed. v. 2-3 il., pl. Tübingen, H. Laupp, 1912.

Proceedings and reports of associations, State forest officers, etc.

Dutch East Indies—Dienst van het boschwezen. Verslag over het jaar, 1911. 141 p. Weltevreden, 1913.

Hawaii—Board of commissioners of agriculture and forestry. Report for the biennial period ending Dec. 31, 1912. 250 p. pl. Honolulu, 1913.

India—Northwest frontier province. Progress report on forest administration for 1911-12. 65 p. Peshawar, 1912.

Maine—Forest commission. Report, 1912, with a report on the wood-using industries of Maine, by J. C. Nellis. 188 p. pl. Waterville, 1912.

Minnesota—Forestry board. Second annual report of the State forester, 1912. 61 p. il., map. Duluth, 1912.

Nigeria, Southern—Forestry department. Annual report for the year 1911. 16 p. Olokemeji, 1912.

Norway—Skogdirektren. Indberetning om det Norske skogvaesen for 1911. 177 p. Kristiana, 1912.

Prussia—Ministerium für landwirtschaft, domänen und forsten Abteilung für forsten. Amtliche mitteilungen, 1911. 47 p. Berlin, 1913.

Rhode Island—Commissioner of forestry. Seventh annual report, 1912. 16 p. Providence, 1913.

Schlesischer forstverein. Jahrbuch für, 1912. 271 p. Breslau, 1913.

West Virginia—Forest, game and fish warden. Second biennial report, 1911-12. 106 p. pl. Belington, W. Va., 1913.

Forest Aesthetics

Street and park trees

St. Louis—City forester. Annual report for the fiscal year ending April 10, 1911. 4 p. St. Louis, 1911.

Forest Education

Arbor day

Iowa—Department of public instruction. Iowa arbor and bird day book, 1913. 109 p. il. Des Moines, 1913.

Forest schools

Biltmore forest school. Biltmore doings, Feb., 1913. 5 p. Darmstadt, Germany, 1913.

Massachusetts agricultural college. School for tree wardens and city foresters. 4 p. Amherst, Mass., 1913.

Wisconsin, University of—College of agriculture. Forest rangers' course, 1912. 14 p. il. Madison, Wis., 1912.

Forest Description

Barton, J. E. The future of forestry in Kentucky and the South. 23 p. il. Frankfort, Ky., State board of forestry, 1913.

Nigeria, Southern—Forestry department. Report by the conservator of forests on his tour through Meko and Shaki districts. 9 p. Olokemeji, 1910.

Swain, E. H. F. The forests of the Bellinger River. 18 p. Sydney, 1912. (New South Wales—Department of forestry. Bulletin. No. 5.)

Forest Botany

Fairchild, David. The Chinese wood-oil tree. 7 p. pl. Wash., D. C., 1913. (U. S. —Department of agriculture—Bureau of plant industry, Circular 108.)

Silviculture

Planting

Heath, A. R. The eucalyptus hardwood trees of California. 33 p. il. Chicago, Ill.

Forest Protection

Insects

O'Kane, W. C. Control of the gypsy moth. 4 p. Durham, N. H., 1912. (N. H.—State moth department. Circular No. 5.)

Patch, Edith M. Elm leaf curl and woolly apple aphid. 24 p. il., pl. Orono, Me., 1912. (Maine—Agricultural experiment station. Bulletin 203.)

Diseases

Davey institute of tree surgery. The training of tree surgeons. 24 p. il. Kent, O., 1913.

Davey institute of tree surgery. Tree surgery, the new profession; healthful, fascinating, remunerative, not overcrowded. 32 p. il. Kent, O., 1913.

Fire

Long, W. H. Effect of forest fires on standing hardwood timber. 6 p. Wash., D. C., 1913. (U. S.—Department of agriculture—Forest service. Circular 216.)

Massachusetts—State forester. Massachusetts forest fire laws and general instructions relative to forest fires; a list of forest wardens. 82 p. Boston, Mass., 1912.

Plummer, Fred G. Prevention and control of forest fires. 10 p. Wash., D. C., 1912.

Forest Management

Zavity, E. J. Farm forestry. 30 p. il. Toronto, 1913. (Ontario agricultural college. Bulletin 209.)

Forest organization

Recknagel, Arthur Bernard. The theory and practice of working plans; forest organization. 235 p. pl. N. Y., John Wiley & sons, 1913.

Forest Economics

Statistics

Lewis, R. G., comp. Forest products of Canada, 1911; lumber, square timber, lath and shingles. 35 p. Ottawa, 1913. (Canada—Dept of the interior—Forestry branch. Bulletin no. 34.)

Lewis, R. G., comp. Forest products of Canada, 1911; poles and cross-ties. 18 p. Ottawa, 1913. (Canada—Dept. of the interior—Forestry branch. Bulletin no. 35.)

Forest Engineering

Hinckley, F. C. Detail surveying and exploration in relation to the management of eastern timberlands. 7 p. Bangor, Me., 1913.

Forest Utilization

Wood-using industries

Maxwell, Hu. The wood-using industries of Vermont. 119 p. pl. Rutland, 1913. (Vermont—Dept of agriculture and forestry. Vermont forestry publication no. 11.)

Wood technology

United States—Dept. of agriculture—Forest service. Mechanical properties of woods grown in the United States. 4 p. table. Wash., D. C., 1913. (Circular 213.)

United States—Dept. of agriculture—Forest service. Tests of packing boxes of various forms. 23 p. il. Wash., D. C., 1913. Circular 214.)

Auxiliary Subjects

Conservation of natural resources

White, J. B. Address at meeting of the directors of the American forestry association at Asheville, N. C., March 25, 1913. 7 p.

White, J. B. Forest conservation and problems of timber and lumbering. 7 p. Chicago, Ill., American lumberman, 1913.

Periodical Articles

Miscellaneous periodicals

Agricultural journal of the Union of South Africa, Feb. 1913.—Forestry in relation to irrigation in South Africa, by K. A. Carlson, p. 219-34; Forestry in the Free State, by K. A. Carlson, p. 242-9.

American city, Jan. 1913.—Shade tree problem of cities; some methods of solution, by Castle, p. 48-9.

Botanical gazette, Feb. 1913.—The morphology of Araucaria brasiliensis, by L. Lancelot Burlingame, p. 97-114.

Bulletin of the Pan American union, Feb. 1913.—The economic resources of Chile, by Walter S. Tower, p. 207-24.

Country gentleman, March 15, 1913.—Plagues of the forest, by Enos A. Mills, p. 434-5.

Field and stream, April 1913.—Our forests and the plunderbund, by Warren H. Miller, p. 1274-5.

Garden magazine, Jan. 1913.—Pitch pine for poor soils, by W. Miller, p. 243-4.

Gardeners' chronicle, March 22, 1913—School of forestry at Cambridge university, p. 178-9.

Journal of Royal society of arts, March 7, 1913.—The development of research work in timber and forest products, by E. Russell Burdon, p. 438-48.

National wool grower, March 1913.—Why state control of forests is impractical, by Jay H. Dobbin, p. 19-21.

Pine cone, March 1913.—Increased use of wood block paving, p. 7.

Popular science monthly, April 1913.—The influence of forests upon climate, by Robert DeC. Ward, p. 313-31.

Resources of Tennessee, April 1913.—State supervision of forestry, by Leonidas C. Glenn, p. 63-73.

Science, March 14, 1913.—Fighting the chestnut blight, p. 417.

Science, March 21, 1913.—The spread of the brown-tail and gypsy moth, p. 439-40.

Scientific American, April 5, 1913.—Fighting the chestnut bark disease, p. 314.

Southern planter, March 1913.—A cheap and efficient silo, by J. C. Courter, p. 290-2; The chestnut bark disease in Virginia, p. 295-6; The forest and the farmer, by Meade Ferguson, p. 315-21.

Trade journals and consular reports

American lumberman, March 15, 1913.—Forest research institute proposed by forester, p. 36; Porto Rican woods, p. 52; Chestnut tree blight, by Samuel B. Detwiler, p. 58-9.

American lumberman, March 22, 1913.—Log-loading methods, p. 46.

American lumberman, March 29, 1913.—Marvelous redwood, p. 1, 77.

American lumberman, April 5, 1913.—Contracts for the sale of government timber; the Forest Service's attitude, p 30; Cotton gum for pulp, p. 30; American forestry association's spring meeting, p. 48-9; Steam log loaders, p. 60.

Carriage monthly, March 1913.—Natural wood finish for the automobile, p. 66-70.

Engineering news, Jan 2, 1913.—Creosoted wood block pavement laid by city day labor in Minneapolis, by Ellis R. Dutton, p. 27-8.

Engineering news, Feb. 6, 1913.—Experience with wood-stave pipe in irrigation, by R. K. Tiffany, p. 244-7.

Engineering news, Feb. 13, 1913.—Merits of different woods for street paving, by H. G. Davis, p. 302.

Furniture journal, March 25, 1913.—The king of cabinet woods; source and supply of true mahogany, p. 54-5.

Handle trade, April 1913.—Hickory, by James B. Adams, p. 7.

Hardwood record, March 25, 1913.—Western larch, p 26-1 · Confusion of common names sometimes serious, p. 21; An analysis of durability, p. 22-3; Sources of hardwood waste, p. 24-6; Eliminating one loss at the sawmill, p. 26-7; Some woods of the pea family, p. 28-9; Northern poplar for paper pulp, p. 31; Hardwood used in logging conifers, p. 33-4; Facts about some precious woods, p. 34.

Hardwood record, April 10, 1913.—Three unusual trees, p. 26-7.

Lumber trade journal, April 1, 1913.—Forest reserve contract is submitted to state; Henry E. Hardtner, of Urbana, La., makes offer to set aside 25,000 acres for reforestation purposes, p. 17-18.

Lumber world review, March 10, 1913.—Use of second growth chestnut, p. 24; How nearly does the modern yellow pine block pavement approach the ideal pavement, by H. L. Collier, p. 26-7; Wood paving block specifications, p. 34.

Lumber world review, March 25, 1913.—Conservation and the cost of growing stumpage, by J. B. White, p. 20-1; The Mississippi Uncle Sam's biggest job, by Phillip R. Keller, p. 22-5.

Mississippi Valley lumberman, March 14, 1913.—Conservation in California, by T. B. Walker, p. 40-1.

Mississippi Valley lumberman, April 4, 1913.—The floods and the cutting of the forests, p. 30.

New York lumber trade journal, April 1, 1913.—The problem of the chestnut blight; what the Pennsylvania commission is doing to eradicate it, by Samuel B. Detwiler, p. 34.

Pacific lumber trade journal, March 1913.—Kiln drying coast woods; equipment and heating apparatus of pipe kilns and blower kilns, by Howard B. Oakleaf, p. 26-34; An expert says that natural reforestation of fir is very feasible, by Thornton T. Munger, p. 41; Flumes in logging operations, by W. D. Starbird, p 65.

Paper, March 5, 1913.—New materials for papermaking, by Clayton Beadle and Henry P. Stevens, p. 21-3.

Paper, March 19, 1913.—Steps in the manufacture of sulphite pulp, by F. M. Williams, p 17-20.

Paper, March 26, 1913.—Position of the woodpulp paper industry, by Martin L. Griffin, p. 15-16; Contributions to paper technology; the influence of soda consumption and time of beating on paper, by Clayton Beadle and Henry P. Stevens, p. 18-22.

Paper, April 9, 1913.—Wood waste utilization; the industry in its relation to expert advice, by John E. Teeple, p. 99; The utilization of wood sawdust in France, p. 20.

Paper mill, Feb. 22, 1913.—United States paper plant investigations, by Raleigh Raines, p. 104; Japanese paper plants, by Raleigh Raines, p. 116, 118, 120; Testing of paper; some considerations of the subject set forth by the Bureau of standards, p. 134, 136.

Paper trade journal, March 6, 1913.—Injury by insects to trees used in the manu-

facture of paper, by A. D. Hopkins, p. 48-50.

Paper trade journal, March 20, 1913.—Paper mulberry as a source of cloth and paper, by C. D. Mell, p. 54-56.

Pioneer western lumberman, March 15, 1913.—My forest fire protective ideas, by T. B. Walker, p. 9-15; Men, tools and supplies in forest fire fighting, by Coert DuBois, p. 19-20.

Pioneer western lumberman, April 1, 1913.—Fighting timber destroyers, p. 25.

Pulp and paper magazine, March 1, 1913.—Japanese leather papers, by Raleigh Raines, p. 157-8; Forest fires, p. 171.

Pulp and paper magazine, March 15, 1913.—The manufacture of sulphite pulp in Scandinavia, by G. B. Steffanson, p. 183-4; New source of supply for the manufacture of paper, by Clayton Beadle and Henry P. Stevens, p. 185-7.

Railway and engineering review, Feb. 15, 1913.—Natural and artificial seasoning of Douglas fir for treatment, by F. D. Beal, p. 142-3.

St. Louis lumberman, March 15, 1913.—Report of committee on wood block specifications, p. 65.

St. Louis lumberman, April 1, 1913.—Famous cypress tree in Mexico, p. 26; Western hemlock; merits ascribed to the wood by the British Columbia forest service, p. 28; The more efficient utilization of wood, by O. T. Swan, p. 68-9.

Southern industrial and lumber review, March 1913.—Many silos now in use among the farmers of Texas, p. 45; Japanese forests, by T. Osborne, p. 82.

Southern lumber journal, March 1, 1913.—An able address on utilization of wood waste and where it profits, by John A. Smith, p. 41-2.

Southern lumber journal, March 15, 1913.—Interesting experiment in forest conservation being made in New York, by Frederic J. Haskin, p. 40; Inspection rules for the classification and inspection of North Carolina pine, p. 48-9.

Southern lumberman, March 15, 1913.—Fighting gypsy moth, p. 36.

Southern lumberman, March 27, 1913.—The standing timber of this country; who owns it and its great value, by B. B. Wood, p. 29-30.

Southern lumberman, April 5, 1913.—The forest regions of Alabama, by Roland M. Harper, p. 31-2.

Southern lumberman, April 12, 1913.—Utilizing fat pine stumps, by J. H. Squires, p. 33-4.

Timber trade journal, March 29, 1913.—Afforestation and technical schools, p. 549; The Swedish wood preservative, cresol calcium, p. 550; The development of woodpulp production, p. 551-6; The expansion of the wood export from Russia, by A. P. Babkin, p. 557-61; Review of the timber trade of 1912, p. 577-671; The importance of the toolroom in the saw mill, by M. Bowis Bale, p. 673-9; Descriptions of saw mill machinery, p. 680-714.

Timberman, March 1913.—How the Panama canal will benefit the Pacific coast lumber industry, by F. G. Donaldson, p. 26; Profitable methods to be used in manufacturing and handling lumber, by James M. Leaver, p. 27-8; The forests of Formosa, p. 29; Logging engineering course from practical and technical viewpoint, p. 30; Modern logging on Pacific coast confronted by engineering problems, by R. D. Moore, p. 31; Administrative control of forests and disposition of national timber, p. 31-2; British Columbia passes important amendments to its forestry act, p. 51-2; A law creating state forest in Oregon, p. 58-9; West Coast associations' revised grading rules, p. 61-5.

United States daily consular report, March 14, 1913.—Copal gums in Germany, by Robert P. Skinner, p. 1268.

United States daily consular report, March 19, 1913.—American woods at Hamburg, by Robert P. Skinner, p. 1370-2.

Wood craft, April 1913.—Bedroom furniture in design and construction, by John Bovingdon, p. 1-4; Lumbering, planing-mill practice and electricity in the northwest, by Ira E. Church, p. 12-16; The art and practice of veneering, by C. R. Mason, p. 23-4.

Wood-worker, March 1913.—The manufacture of hickory handles, by H. B. Alexander, p. 28-9; A talk on treating and drying lumber, by Elmer E. Perkins, p. 33-4.

Forest journals

Allgemeine forst- und jagd-zeitung, Feb. 1913. Eine probe auf die richtigkeit des reinertragsexempels, by Trebeljahr, p. 41-52; Beschneiden und aesten, by Jürgens, p. 52-4.

Allgemeine forst- und jagd-zeitung, March 1913.—Aus den wäldern des Kaukasus, by Guse, p. 77-80; Versuchspflanzungen, by Krug, p. 80-3.

Bulletin de la Société centrale forestière de Belgique, March 1913.—Dépérissement prématuré des pineraies de la Campine, by A. Naets, p. 149-63; Le côté économique des boisements en Campine, by Ch. Durieux, p. 163-8; Statistique des chemins de fer de l'État belge au point de vue forestier, p. 168-72; Conditions forestières de la région du lac Lesser Slave, by D. Roy Cameron, p. 172-9.

Canadian forestry journal, Feb. 1913.—The problem of forestry, by Henry S. Graves, p. 25-7.

Forestry quarterly, March 1913.—Eric outlook system, by F. B. Knapp, p. 1-4; The preservative treatment of wood, by Irving W. Bailey, p. 5-20; Method for regulating the yield in selection forests, by Walter J. Morrill, p. 21-7; South Dakota school lands, by Paul D. Kelleter, p. 28-34; Probable evolution in the sawmill

industry, by Burt P. Kirkland, p. 35-40; Some aspects of European forestry, by A. B. Recknagel, p. 41-57; Let's not overlook the woodlots, by Alfred Gaskill, p. 58-61; Disengagement cuttings in mixed small sapling stands, by W. D. Sterrett, p. 62-3; Northern limits of east Canadian trees in relation to the climate, by H. R. Christie, p. 64-6; Concerning seed spots, by J. A. Larsen and R. J. Smith, p. 67-8.

Forstwissenschaftliches centralblatt, Feb. 1913.—Die stärke- und wertzunahme des laubstammholzes, by Heck, p. 65-74; Ein beitrag zur würdigung des blendersaumschlages, by Passler, p. 74-8; Forstliche wirtschafts- und bestandesübersichtskarten, by Theodor Glaser, p. 92-6; Aufforstungserfolge im hochgebirg, p. 92-102.

Forstwissenschaftliches centralblatt, March 1913.—Hitzerisse an fichten, by A. Flander, p. 124-7; Holzschwelle oder eisenschwelle?, p. 143-7.

Indian forest records, Jan. 1913.—On some new and other species of Hymenoptera in the collections of the Zoological branch of the Forest research institute, Dehra Dun, by P. Cameron; pt. 2, p. 1-33; Useful exotics in Indian forests; no. 1, Prosopis juliflora, by R. S. Hole; pt. 3, p. 1-28; On Albizzia lathamii, by R. S. Hole; pt. 4, p. 1-6; Note on the utilization of bamboo for the manufacture of paper-pulp, by R. S. Pearson; pt. 5, p. 1-121.

Indian forester, Feb. 1913.—Note on the chief fodder grasses of Indian forests, by R. S. Hole, p. 69-81; Eucalyptus in northwest India, by R. N. Parker, p. 81-6.

Indian forester, March 1913.—The cultivation of drugs in Indian forests, by Puran Singh, p. 113-27; A description with notes on the working of the Casuarina plantations of the north Kanara coast, by W. A. Miller, p. 141-9; Bamboos and the different methods of cutting them, by A. Wimbush, p. 155-7.

North woods, March 1913.—Use of mining timber on the iron ranges, by Hugo C. Nelson, p. 17-21.

Revue des eaux et forêts, March 1, 1913.—L'impot forestier; l'évaluation du revenu imposable des forêts, by A. Arnould, p. 129-31; Au sujet des inondations du bassin de la Seine, by Roger Ducamp, p. 131-5; Le "pin allemand" en Suède, by H. Perrin, p. 136-9.

Quarterly journal of forestry, April 1913.—Forestry in the Spessart, by William Schlich, p. 85-108; The minute structure of the wood of Cupressus macrocarpa, by W. S. Jones, p. 108-17; A Swedish forestry excursion, by A. C. Forbes, p. 117-24; Forestry in the Carpathians, by Fraser Story, p. 125-39; Insect notes for 1912, by A. T. Gillanders, p. 139-42; Afforestation in the Highlands, by Somerville, p. 143-46; The pit wood trade in Germany, p. 155-6.

Schweizerische zeitschrift für forstwesen, Feb. 1913.— Zur frage der prüfung forstlicher sämereien, by H. Knuchel, p. 39-42; Die witterung des jahres 1912 in der Schweiz, by R. Billwiller, p. 42-8; Der lärchenwickler im Oberengadin, p. 48-53.

Zeitschrift für forst- und jagdwesen, Feb. 1913.—Die einweihung des erweiterungsbaues der forstakademie Eberswalde, p. 68-80; Der Geist-Kähler'sche wühlgrubber, by Schultz, p. 92-103; Die zuständigkeit der staatsforstbeamten zur leitung der löscharbeiten bei waldbränden, by Kreysern, p. 105-8; Die verwendung und bedeutung des holzes im deutschen bergwerksbetriebe, by Dreyer, p. 109-19.

FLORIDA WANTS GOOD FOREST LAWS.

Public-spirited citizens in Florida have applied to the Department of Agriculture for information upon which a law may be based for the protection of the State's forests. They hold that fire, careless cutting, and destructive turpentining methods have impaired a foremost industry of the State and unless some legislation is devised to provide for thrift and care in the management of woodlands, Florida will suffer great financial loss.

AN INTERESTING EXPERIMENT IN MUNICIPAL FORESTRY.

In the spring of 1912 Mr. George Glynn, Chief of the Water Bureau of the City of Syracuse, who has been interested in the forests of Northern New York for some years, asked the College of Forestry to take charge of 150 acres of woodland owned by the City of Syracuse and covering a portion of its watershed on Skaneateles Lake. The college maintained a party of forestry students on the tract during the summer of 1912 and besides making a careful estimate of the timber and a forest map of the tract, carried on extensive improvement cuttings. This work has been supplemented this spring by the planting of several thousand trees.